ENVIRONMENTAL ASSESSMENT

MAINTENANCE DREDGING

BOSTON HARBOR
BOSTON, MASSACHUSETTS

MARCH 1984

US Army Corps
of Engineers
New England Division

FINDING OF NO SIGNIFICANT IMPACT

The Environmental Assessment for this project is attached and describes the proposed action, need for the project, alternatives, affected environment and environmental consequences.

Implementation of the proposed project will not require a significant commitment of physical, natural or human resources. Coordination among all parties during the planning process has resulted in the recommended maintenance proposal. The impacts have been outlined in the assessment and are summarized below.

Impacts during dredging and disposal operations would include a temporary increase in turbidity and a minor release of certain contaminants. These impacts would not significantly affect the water quality or organisms in the vicinity of the activities. The operation would involve displacement of the harbor sediments which would remove bottom-associated invertebrates from the dredge sites and bury those associated with the disposal site. Recolonization would occur in the project area soon after operations ceased. Bioassay tests indicated that disposal of the sediments would not cause any acute chemical impacts to organisms in the vicinity of the dump site. Bioaccumulation tests exhibited potential uptake of certain sediment contaminants; however, the relative tissue levels were well within Federal Food and Drug Administration's action levels for shellfish and fish or were within the range of baseline tissue levels of most organisms. Field studies of other areas have shown accumulation associated with disposal operations to be temporary and would decrease after operations were completed. Federally listed endangered and threatened species which use the general area where the dump site is located would avoid the operations. Disposal activities would not jeopardize continued existence of the endangered populations in the area or their food species.

There does not appear to be any remaining major environmental problem, conflict or disagreement in implementing the proposed work. I have determined that implementation of the proposed action will not have a significant impact on the human environment.

10 December 1981
Date

C E Edgar III
C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

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ENVIRONMENTAL ASSESSMENT

FOR

BOSTON HARBOR MAINTENANCE DREDGING

BOSTON, MASSACHUSETTS

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Corps of Engineers, NED

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Corps of Engineers, NED

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

DECEMBER 1981

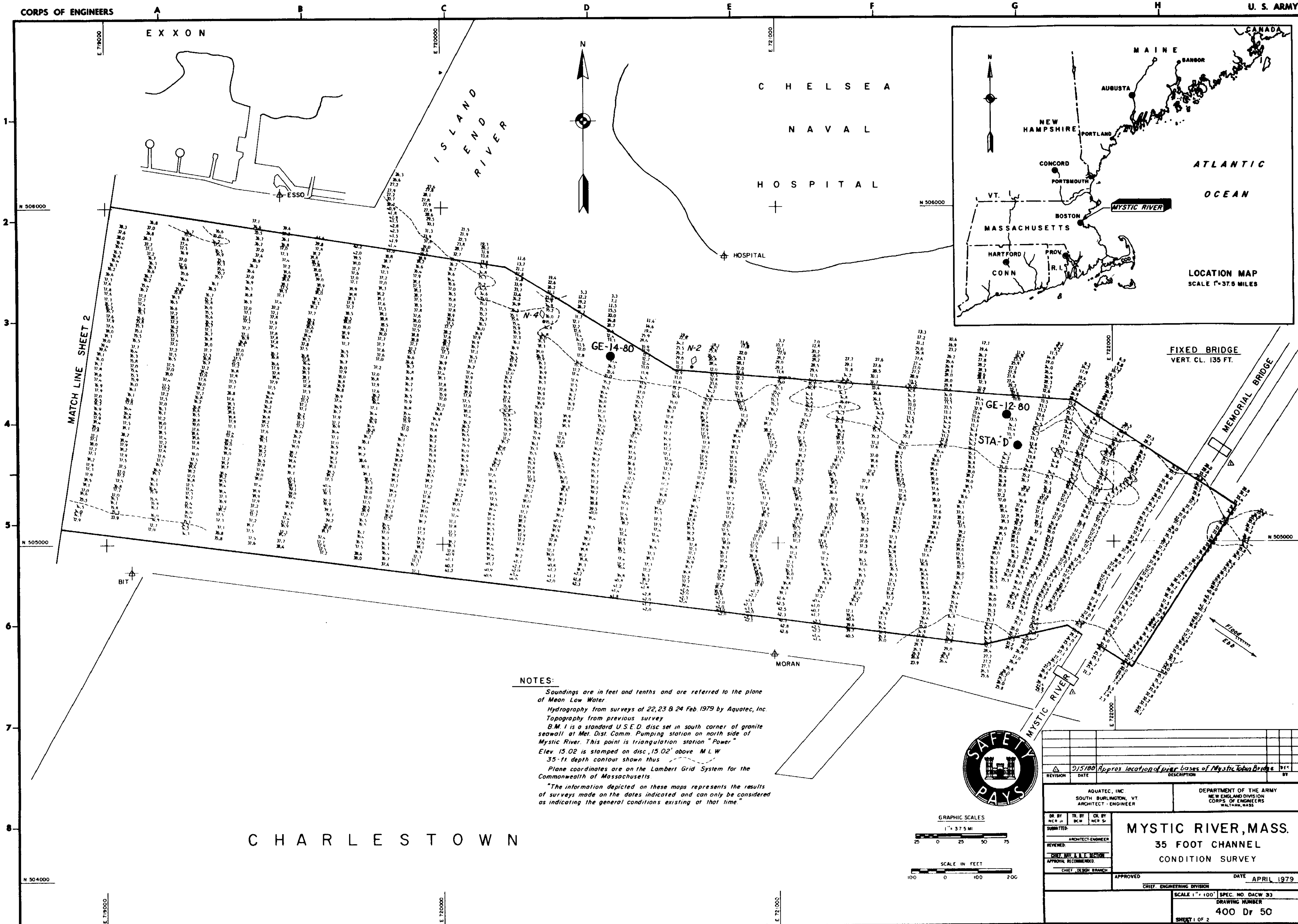
INTRODUCTION

This Environmental Assessment discusses the need for and the environmental impacts of the proposed maintenance dredging of the Federal navigation channels in the Mystic and Chelsea Rivers and the anchorage at President Roads. This action will involve removal of approximately 425,000 cubic yards (c.y.) of harbor sediments for ocean disposal. The estimate is based on a 1978 survey. Major areas of concern include, impacts to water quality and aquatic resources at the dredging and disposal sites. The assessment was partially based on an Environmental Report on the Maintenance Dredging of Boston Harbor prepared for the Corps of Engineers, New England Division by Jason M. Cortell and Associates, Inc. (1977).

I. PROJECT DESCRIPTION

Maintenance dredging is proposed in the Mystic and Chelsea Rivers and in President Roads Anchorage. The Federally authorized dimensions for these projects are: Mystic River Channel - 35 feet deep with widths varying from 600 feet to 1,000 feet, extending approximately one mile from the confluence of the Mystic and Chelsea Rivers to a point just downstream of the Alford Street Bridge (Figs. 1 and 2); Chelsea River Channel - 35 feet deep with widths varying from 225 feet to 250 feet, extending approximately 1-1/2 miles upstream from the confluence of the Mystic and Chelsea Rivers; (Figs. 3, 4, and 5) and President Roads Anchorage in the outer harbor - 40 feet deep for an area approximately 2,000 feet by 5,500 feet (Fig. 6).

Maintenance dredging within the limits of these Federal projects would be accomplished with a clamshell dredge, which would place the sediment in scows that would be towed to the Foul Area Ocean Disposal site in outer Massachusetts Bay and point dumped at a buoy. The work would start in the spring of 1982 and continue into the fall. The contractor would be permitted to work 24 hours per day, but actual work shifts would depend on the capability of the approved low bidder. The typical contractor would work two, ten-hour shifts. Records of progress on completed jobs similar to the proposed work indicate that a maximum of six scows per day could be brought to the dispsoal area. The average scow can hold 1,500 to 2,000 cubic yards. A more realistic estimate would be four scows per day with many days, perhaps as much as 20-25 percent of the contract period, when no scows would be towed because of weather problems.



CORPS OF ENGINEERS
U. S. ARMY
EXXON
ESSO
ISLAND END RIVER
CHELSEA NAVAL HOSPITAL
HOSPITAL
MATCH LINE SHEET 2
N-4
N-2
GE-14-80
GE-12-80
STA-D
FIXED BRIDGE
VERT. CL. 135 FT.
MEMORIAL BRIDGE
MYSTIC RIVER
MORAN
BIT
Flood
Ebb
CHARLESTOWN
LOCATION MAP
SCALE 1"=37.5 MILES
CANADA
MAINE
BANGOR
AUGUSTA
NEW HAMPSHIRE
PORTLAND
CONCORD
PORTSMOUTH
ATLANTIC OCEAN
VT.
BOSTON
MYSTIC RIVER
MASSACHUSETTS
HARTFORD
PROV.
CONN
R. I.
NOTES:
Soundings are in feet and tenths and are referred to the plane of Mean Low Water.
Hydrography from surveys of 22,23 & 24 Feb. 1979 by Aquatec, Inc.
Topography from previous survey
B.M. I is a standard U.S.E.D. disc set in south corner of granite seawall at Met. Dist. Comm. Pumping station on north side of Mystic River. This point is triangulation station "Power"
Elev. 15.02 is stamped on disc, 15.02' above M L W
35-ft. depth contour shown thus
Plane coordinates are on the Lambert Grid System for the Commonwealth of Massachusetts.
"The information depicted on these maps represents the results of surveys made on the dates indicated and can only be considered as indicating the general conditions existing at that time."
SAFETY PAYS
GRAPHIC SCALES
1" = 37.5 MI
SCALE IN FEET
9/5/80 Approx. location of pier bases of Mystic Tobin Bridge
REVISION
DATE
DESCRIPTION
BY
AQUATEC, INC.
SOUTH BURLINGTON, VT.
ARCHITECT - ENGINEER
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
DR. BY NCR Jr
TR. BY BCM
CK. BY NCR Sr
SUBMITTED:
ARCHITECT-ENGINEER
REVIEWED:
CHIEF, NAV. & R. E. SECTION
APPROVAL RECOMMENDED:
CHIEF, DESIGN BRANCH
MYSTIC RIVER, MASS.
35 FOOT CHANNEL
CONDITION SURVEY
APPROVED
CHIEF, ENGINEERING DIVISION
DATE APRIL 1979
SCALE 1" = 100'
SPEC. NO. DACW 33
DRAWING NUMBER
400 Dr 50
SHEET 1 OF 2

FIGURE 1

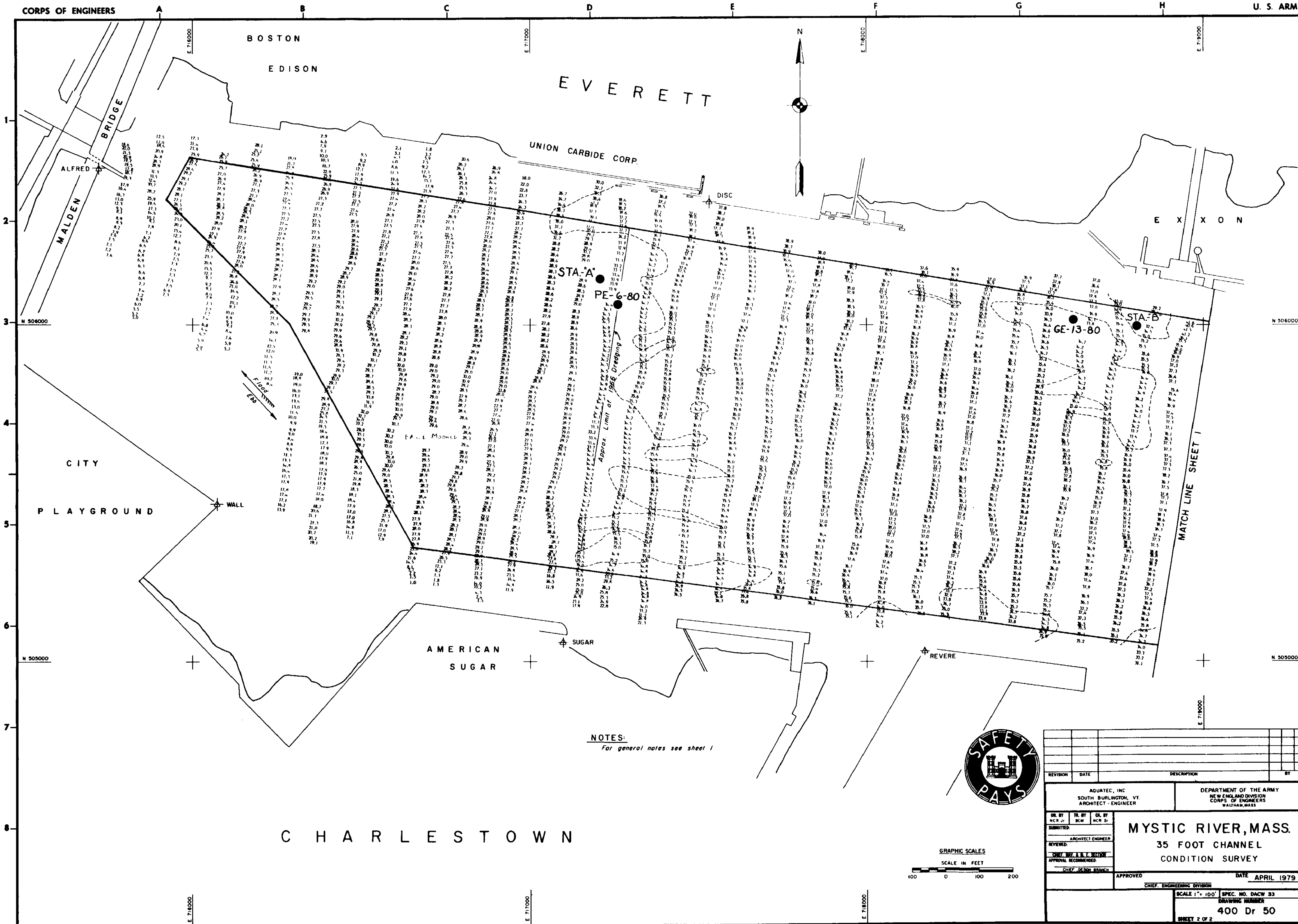
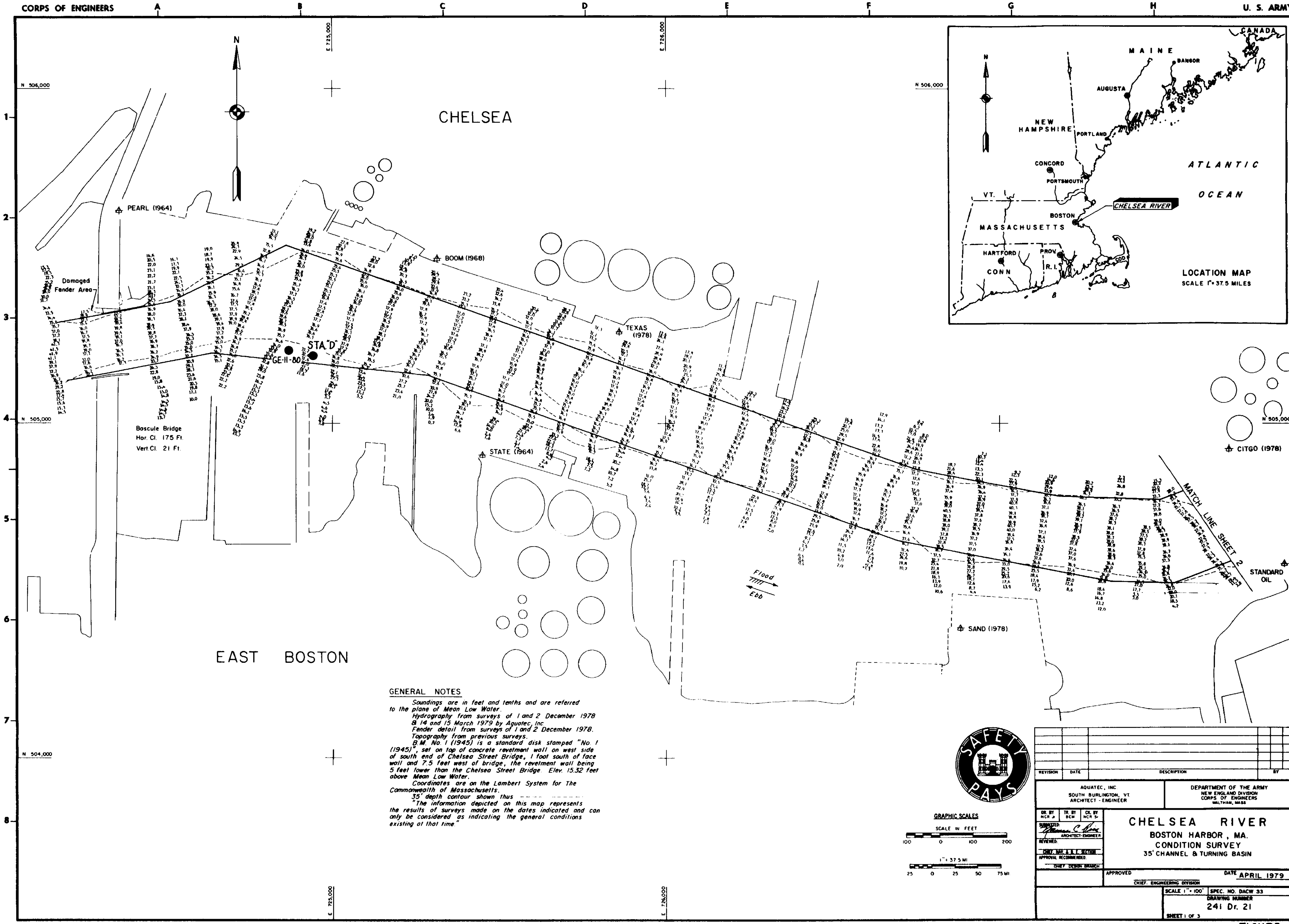

CORPS OF ENGINEERS
U. S. ARMY
BOSTON
EDISON
EVERETT
UNION CARBIDE CORP.
DISC
EXXON
ALFRED
MALDEN
BRIDGE
STA-'A'
PE-6-80
GE-13-80
STA-'B'
Approx. Limit of 1968 Dredging
Flood
Ebb
CITY
PLAYGROUND
WALL
AMERICAN
SUGAR
SUGAR
REVERE
MATCH LINE SHEET 1
N 506000
N 505000
E 716000
E 717000
E 718000
E 719000
NOTES:
For general notes see sheet 1
CHARLESTOWN
SAFETY PAYS
GRAPHIC SCALES
SCALE IN FEET
100
0
100
200
REVISION
DATE
DESCRIPTION
BY
AQUATEC, INC
SOUTH BURLINGTON, VT
ARCHITECT - ENGINEER
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
MYSTIC RIVER, MASS.
35 FOOT CHANNEL
CONDITION SURVEY
APPROVED
DATE APRIL 1979
CHIEF, ENGINEERING DIVISION
SCALE 1"= 100'
SPEC. NO. DACW 33
DRAWING NUMBER
400 Dr 50
SHEET 2 OF 2

FIGURE 2



CORPS OF ENGINEERS
U. S. ARMY
CHELSEA
EAST BOSTON
PEARL (1964)
BOOM (1968)
TEXAS (1978)
STATE (1964)
CITGO (1978)
SAND (1978)
STANDARD OIL
STA "D"
GE-11-80
Damaged Fender Area
Bascule Bridge
Hor. Cl. 175 Ft.
Vert. Cl. 21 Ft.
Flood
Ebb
MATCH LINE SHEET 2
N 506,000
N 505,000
N 504,000
E 725,000
E 726,000
MAINE
BANGOR
AUGUSTA
NEW HAMPSHIRE
PORTLAND
CONCORD
PORTSMOUTH
VT.
MASSACHUSETTS
BOSTON
CHELSEA RIVER
HARTFORD
CONN
PROV.
R.I.
COD
CANADA
ATLANTIC OCEAN
LOCATION MAP
SCALE 1" = 37.5 MILES
GENERAL NOTES
Soundings are in feet and tenths and are referred to the plane of Mean Low Water.
Hydrography from surveys of 1 and 2 December 1978 & 14 and 15 March 1979 by Aquatec, Inc.
Fender detail from surveys of 1 and 2 December 1978.
Topography from previous surveys.
B.M. No. 1 (1945) is a standard disk stamped "No. 1 (1945)", set on top of concrete revetment wall on west side of south end of Chelsea Street Bridge, 1 foot south of face wall and 7.5 feet west of bridge, the revetment wall being 5 feet lower than the Chelsea Street Bridge. Elev. 15.32 feet above Mean Low Water.
Coordinates are on the Lambert System for The Commonwealth of Massachusetts.
35' depth contour shown thus
"The information depicted on this map represents the results of surveys made on the dates indicated and can only be considered as indicating the general conditions existing at that time."
SAFETY PAYS
GRAPHIC SCALES
SCALE IN FEET
100 0 100 200
1" = 37.5 MI.
25 0 25 50 75 MI.
REVISION
DATE
DESCRIPTION
BY
AQUATEC, INC.
SOUTH BURLINGTON, VT.
ARCHITECT - ENGINEER
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
DR. BY NCR Jr
TR. BY BCM
CK. BY NCR Sr
SUBMITTED:
ARCHITECT-ENGINEER
REVIEWED:
APPROVAL RECOMMENDED:
CHIEF DESIGN BRANCH
CHELSEA RIVER
BOSTON HARBOR, MA.
CONDITION SURVEY
35' CHANNEL & TURNING BASIN
APPROVED
CHIEF, ENGINEERING DIVISION
DATE APRIL 1979
SCALE 1" = 100'
SPEC. NO. DACW 33
DRAWING NUMBER
241 Dr. 21
SHEET 1 OF 3

FIGURE 3

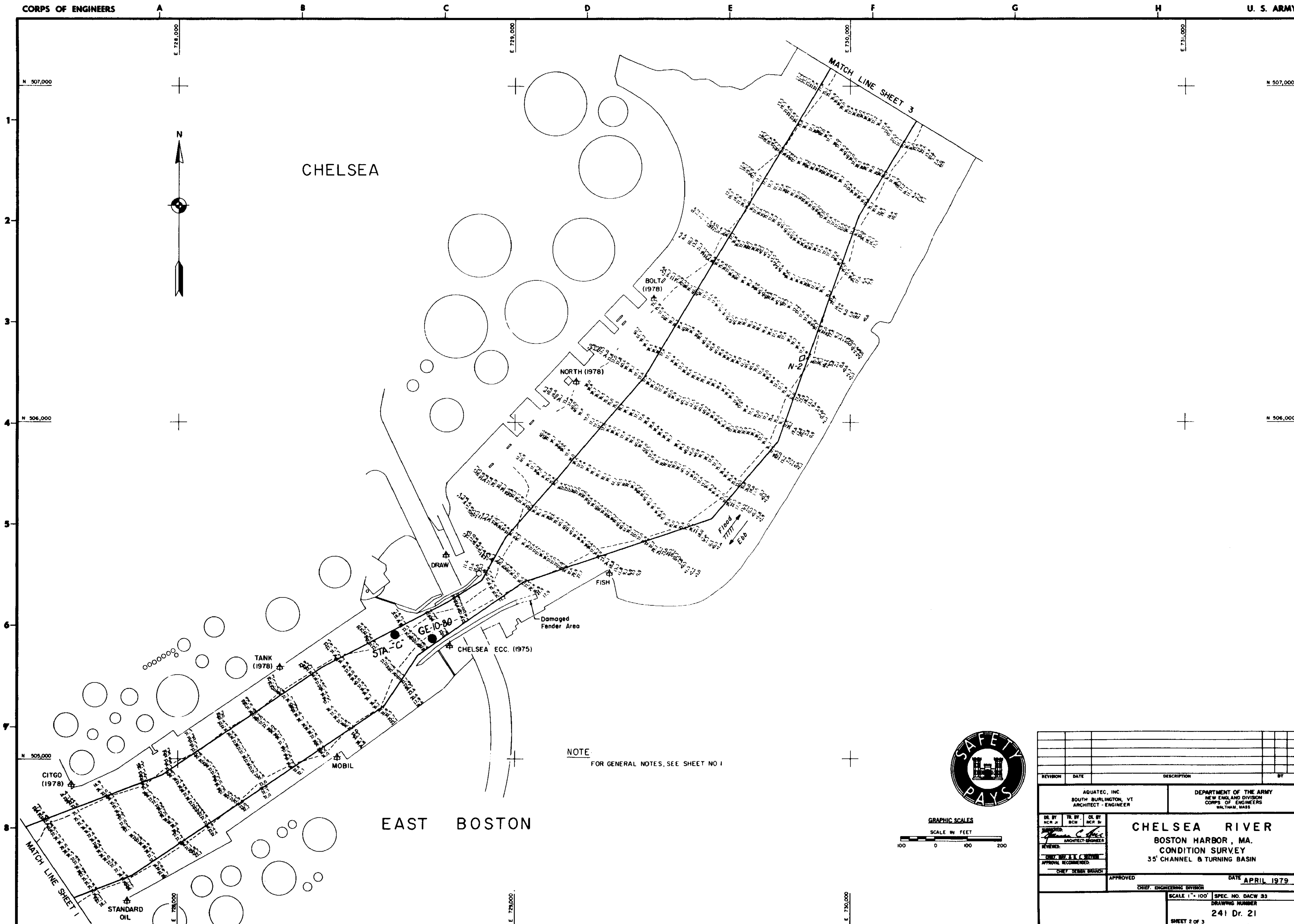

CORPS OF ENGINEERS
U. S. ARMY
CHELSEA
EAST BOSTON
N
MATCH LINE SHEET 3
MATCH LINE SHEET 1
BOLT (1978)
NORTH (1978)
DRAW
FISH
Damaged Fender Area
CHELSEA ECC. (1975)
STA-C
GE-10-80
TANK (1978)
MOBIL
CITGO (1978)
STANDARD OIL
N-2
Flood
Ebb
N 507,000
N 506,000
N 505,000
E 728,000
E 729,000
E 730,000
E 731,000
NOTE
FOR GENERAL NOTES, SEE SHEET NO 1
SAFETY PAYS
GRAPHIC SCALES
SCALE IN FEET
100 0 100 200
AQUATEC, INC.
SOUTH BURLINGTON, VT
ARCHITECT - ENGINEER
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS
CHELSEA RIVER
BOSTON HARBOR, MA.
CONDITION SURVEY
35' CHANNEL & TURNING BASIN
DATE APRIL 1979
SCALE 1" = 100'
SPEC. NO. DACW 33
DRAWING NUMBER
241 Dr. 21
SHEET 2 OF 3

FIGURE 4

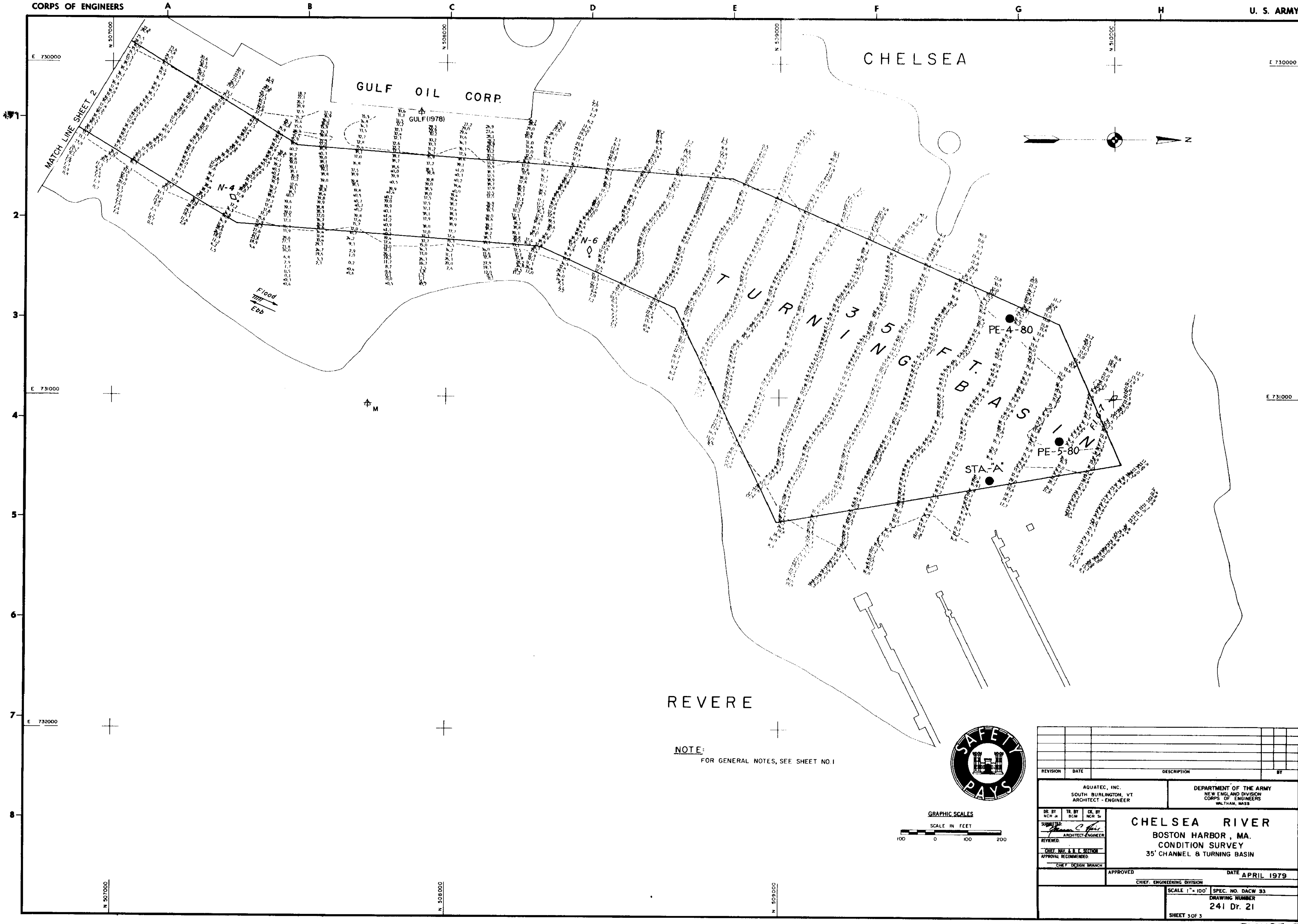
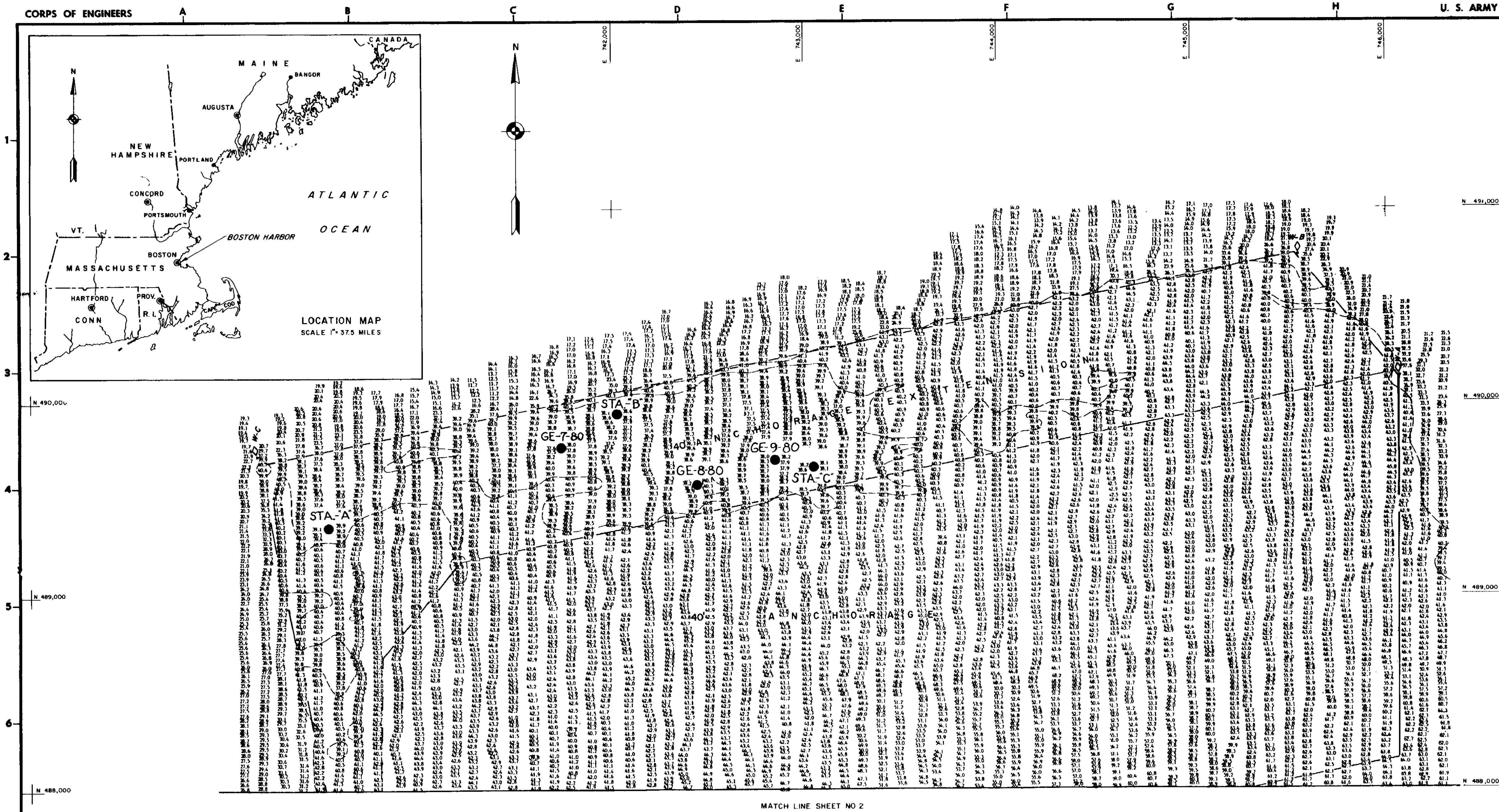

CORPS OF ENGINEERS
U. S. ARMY
CHELSEA
GULF OIL CORP.
GULF (1978)
MATCH LINE SHEET 2
N-4
N-6
Flood
Ebb
TURNING BASIN 35 FT.
PE-4-80
PE-5-80
STA. "A"
REVERE
NOTE:
FOR GENERAL NOTES, SEE SHEET NO. 1
SAFETY PAYS
GRAPHIC SCALES
SCALE IN FEET
REVISION
DATE
DESCRIPTION
BY
AQUATEC, INC.
SOUTH BURLINGTON, VT
ARCHITECT - ENGINEER
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS
CHELSEA RIVER
BOSTON HARBOR, MA.
CONDITION SURVEY
35' CHANNEL & TURNING BASIN
APPROVED
CHIEF, ENGINEERING DIVISION
DATE APRIL 1979
SCALE 1" = 100'
SPEC. NO. DACW 33
DRAWING NUMBER
241 Dr. 21
SHEET 3 OF 3

FIGURE 5



NOTE:

Soundings in feet and tenths and refer to the plane of Mean Low Water

Hydrography from survey of October 16-18, 1978 by Aquatec, Inc

B M 8 (1952) is a standard disk, set in top of granite coping slab around sewage ventilation pit in front of M.D.C. pumping station building on Deer Island on east side of road to Fort Dawes. It is 12 feet southeast from center line of porch at main entrance and 20 feet northeast of center line of road. Elevation 15.26 feet above Mean Low Water

Plane coordinates are on the Lambert Grid System for the Commonwealth of Massachusetts

40-foot depth contour shown thus — — — — — —

"The information depicted on this map represents the results of surveys made on the dates indicated and can only be considered as indicating the general conditions existing at that time"

SAFETY PAYS

GRAPHIC SCALES

SCALE IN FEET

200 0 200 400

1" = 37.5 MI.

25 0 25 50 75 MI

REVISION	DATE	DESCRIPTION	BY

AQUATEC, INC
SOUTH BURLINGTON, VT.
ARCHITECT - ENGINEER

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS

DR BY NCR Jr	TR BY BCM	CK BY NCR Sr

SUBMITTED ARCHITECT-ENGINEER

REVIEWED CHIEF, NAV. & B. E. SECTION

APPROVAL RECOMMENDED CHIEF, DESIGN BRANCH

BOSTON HARBOR, MA.
40 FOOT ANCHORAGE AND VICINITY CONDITION SURVEY

APPROVED CHIEF, ENGINEERING DIVISION

DATE DEC 1978

SCALE 1" = 200' | SPEC. NO. DACW 33

DRAWING NUMBER 1813 Dr 1

SHEET 1 OF 3

FIGURE 6

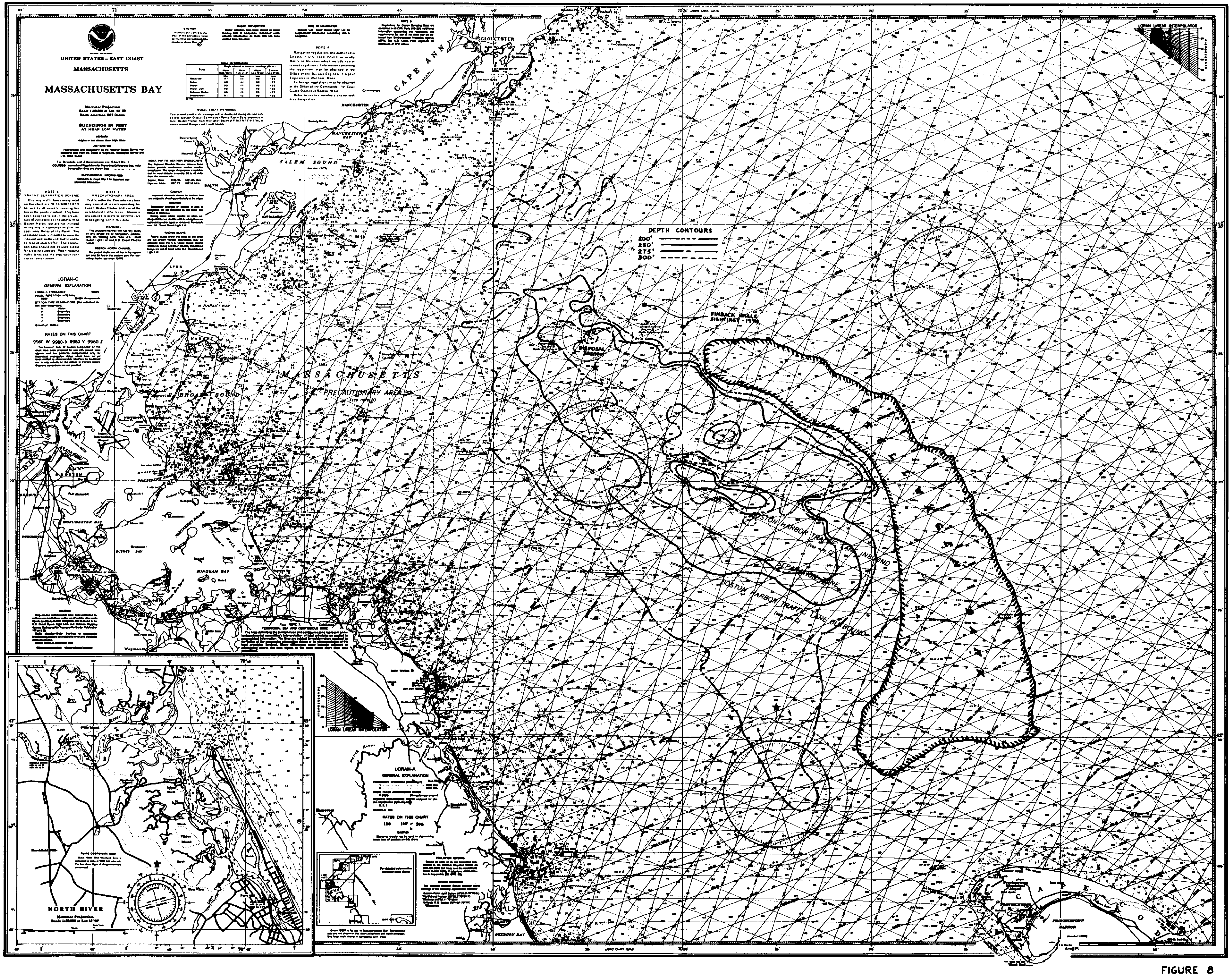

UNITED STATES - EAST COAST
MASSACHUSETTS
MASSACHUSETTS BAY
SOUNDINGS IN FEET AT MEAN LOW WATER
GLOUCESTER
CAPE ANN
MANCHESTER
SALEM SOUND
SALEM
LYNN
LORAN-C
GENERAL EXPLANATION
RATES ON THIS CHART
MASSACHUSETTS
PRECAUTIONARY AREA
BAY
BROAD SOUND
DORCHESTER BAY
QUINCY BAY
HINGHAM BAY
DEPTH CONTOURS
200'
250'
275'
300'
FINBACK WHALE
DISPOSAL
BOSTON HARBOR TRAFFIC LANE INBOUND
SEPARATION ZONE
BOSTON HARBOR TRAFFIC LANE OUTBOUND
LORAN LINEAR INTERPOLATOR
LORAN-A
GENERAL EXPLANATION
RATES ON THIS CHART
NORTH RIVER
PROVINCETOWN HARBOR
DUXBURY BAY

FIGURE 8

II. PURPOSE AND NEED FOR THE PROJECT

The necessity of maintenance dredging in each project area is described below.

A. Mystic River:

Removal of shoal material would reduce economic losses due to tidal delays and lightering. Navigation losses are estimated to be in excess of $1 million annually. Navigation safety, which is critical due to the periodic arrival of liquid natural gas (LNG) tankers, would be improved. During the last maintenance in 1966, the project was not dredged to its upstream limit because of lack of use. Since that time new and increased use requires that the 1966 limit be extended upstream. In 1979, domestic vessels delivered 4.8 million tons of cargo and the total cargo exceeded 7.5 million tons. The major commodities include petroleum products, liquified gases, sugar, and iron and steel scrap.

B. Chelsea River:

Shoaling in the channel is relatively minor (approximately 25,000 cubic yards). However, the sediment has accumulated in areas critical to vessel maneuverability such as near resticted bridge openings. Improvement of navigation safety which decreases the possibility of oil spills and damage to bridges is the primary objective in maintaining authorized width and depth in the narrow Chelsea River channel.

C. President Roads Anchorage:

Shoaling along the northeast and northwest portions of the anchorage combined with the Logan Airport overflight path, severely restricts the amount of deep water (40 feet) anchorage available. The 40-foot depth is essential to accommodate the deep draft tankers which use the anchorage for bunkering and lightering before proceeding into Boston or going to ports along the Maine coast. In 1979, 500 vessels used the anchorage, with some staying for as long as 20 days. Dangerous crowding situations occur while vessels wait for access to berth because of ongoing offloading activities or other offloading delays.

President Roads, also known as Anchorage #2, is the only general purpose inner harbor area and handles 95% of all commercial tonnage. Anchorage #1 on Bird Island Flats is no longer large enough or deep enough to handle the ships that use the harbor. The airport fill and breakwater as well as shipping activities at the Bethlehem Shipyard drydocks severely limit the usefulness of that anchorage.

The only alternative deep water anchorage area is in Broad Sound. However, this area is fully exposed to easterly gales, has only fair holding gound, does not have launch service and is often subject to dense sea fog. Because of the lack of shelter, lightering and bunkering activities are unsafe in Broad Sound except in mid-summer.

III. ALTERNATIVES

Alternatives to the proposed action include no action and alternative methods of disposal.

A. No Action:

With the no action alternative, shoaling will continue. Extreme shoaling will cause decreased usage of the channel and anchorage areas, pose a safety hazard to navigation and lead to a negative impact on the project area. For example the shallow depth of the Mystic and Chelsea Rivers impedes the shipping of product by large vessels, thereby necessitating shipments by smaller vessels at higher total cost. Also, because of the unsafe and inefficient conditions of the channel, large ships will experience continued delays in their wait for tides to change. Realizing that Boston is the largest port in the New England area, certain commodities would experience price increases in proportion to the worsening in navigation.

There would also be greater frequency of vessel damages due to the higher risk of groundings. This not only increases the maintenance costs to the shippers but also the risk of spillage of petroleum or hazardous chemicals being shipped.

B. Alternative Methods of Disposal:

Alternative methods of dredged material disposal in the Boston Harbor area, associated with both maintenance and improvement dredging, were the subject of discussion at a 21 May 1981 interagency meeting between the Corps of Engineers and various Federal and State agencies. A number of methods of disposal of sediments were discussed, in conjunction with an ongoing Corps study (see page 9) of possible Federal navigation improvements in Boston Harbor. The alternatives are also applicable with the exception of bulkheading or containment, to this maintenance dredging project notwithstanding the difference in scope of the two projects (425,000 c.y. from this project vs the 4.3 million c.y. from the improvement project). Suggested potential alternatives at the meeting and subsequent correspondence included: the Boston Foul Area; Fort Point Channel, Boston Harbor Islands; Barrier Island creation; Logan Airport; Boston Marine Industrial Park; general sanitary landfill; quarry and gravel pits; and dredged material containment.

1. Foul Area Ocean Disposal Site. The Foul Area disposal site is the only EPA designated ocean disposal site in the Boston area. Disposal would be acceptable provided ocean dumping requirements are met and no other alternative site is available.

2. Fort Point Channel. In conjunction with development of the downtown Boston area, the Corps suggested disposal in the Fort Point Channel for development of the much valued harborfront property. However, there are a multitude of water-related projects planned by various local

and private interests for development of the area. Filling in the channel would be in conflict with these plans and, therefore, was eliminated from consideration.

3. Boston Harbor Island/Barrier Island Creation. Island and marsh creation and/or reclamation have been suggested as a potential disposal alternative. However, such disposal would require the use of relatively "clean" materials to minimize any chemical impacts to the water quality and aquatic organisms. The sediments derived from this project are not considered "clean" and, therefore, would not be appropriate for shallow water or intertidal disposal.

4. Logan Airport/Boston Marine Industrial Park. These projects, as currently proposed by Massachusetts Port Authority, presently have no need for fill material. The material provided by this project would also not be suitable for subsequent structural development of the filled sites. In addition, shallow water or intertidal disposal of the clam flats in the Logan Airport area would require clean fill as well as mitigation of the lost clam habitat.

5. General Sanitary Landfill Cover. The use of dredged material as a sanitary landfill cover would also be a potential disposal method. Such disposal would require use of clean material to minimize the impact of pollutants leaching from the dried dredged sediments to the surrounding environment. The drying of dredged sediments leads to the formation of acid conditions which can chemically change previously unavailable contaminants to more soluble forms (Gambrell et. al. 1978). In addition, sites such as the Lynn Landfill Site can only receive about 30,000 c.y., which is about 7% of the total dredged volume. A large number of such disposal areas would be needed to accommodate the volumes generated by this project. This would result in a multitude of logistical problems. The cost of transportation would have to be borne by local interests.

6. Quarries and Gravel Pits. A quarry in Quincy was also suggested as a potential disposal site. However, questions such as where and by whom the material would be brought ashore, who would pay for the trucking, and how the material would be stored temporarily would need to be resolved. All rehandling costs would be local responsibilities.

7. Dredged Material Containment. There are presently no available containment faciliites which could receive the dredged materials. Construction of such a facility would require suitable material such as quarry stone and rock filter to contain the sediments. Since no authorization currently exists to develop such a facility, the cost would have to be borne by local interests.

It is apparent that disposal alternatives 2 - 7 may be rejected based on a variety of engineering, logistical, economic and environmental reasons. This conclusion has been supported by the Massachusetts Department of Environmental Quality and Engineering in a 17 June 1981 letter. Thus, the only reasonable option is ocean disposal at the designated Foul Area Site.

IV. ENVIRONMENTAL SETTING

A. BOSTON HARBOR

1. General

Boston Harbor is located on the coast of Massachusetts approximately equidistant between Cape Cod and the New Hampshire border (see insert of Figure 7). The harbor is formed by a group of outlying islands and the peninsula areas of Winthrop and Hull. For the purpose of this report, the harbor can be divided into the following sections: Mystic River; Chelsea River; the Boston Inner Harbor, which includes the main ship channel, lower Charles River, Fort Point Channel and the Reserve Channel; and Boston Outer Harbor, which includes Dorchester Bay, Quincy Bay, Hingham Bay, President Roads and Nantasket Roads.

The harbor is the largest port in the New England region, covering approximately 47 square mile area. It is utilized by shipping, commercial, industrial, fishing and recreational interests.

Since 1965, approximately 2.36 million cubic yards (c.y.) of dredged material and rock have been removed from various reaches of the harbor including Mystic River, Mystic and Chelsea River confluence, Main Ship and Broad Sound channels. The Corps of Engineers is currently studying the feasibility of providing a 45-foot depth at MLW by removing 4.3 million c.y. of harbor sediment and 675,000 c.y. of ledge to improve the harbor's navigability.

2. Tidal Currents and Harbor Circulation

The principal currents in the harbor are tidal in origin, although wind driven currents occur during storms. Freshwater flows discharged from the Mystic, Charles and Chelsea Rivers generally overlie the more dense seawater flows from the tides. Freshwater flows average 500 cubic feet per second (cfs) in the summer. Tidal input are orders of magnitude greater with volumes ranging from 10.6 billion gallons at low tide to 179.9 billion gallons at high tide (Metcalf and Eddy, 1976). Approximately 73.3 billion gallons are exchanged through three channels linked with the President Roads area and one channel linked with Nantasket Roads.

The average tidal range in Boston Harbor is 9.5 feet with spring tidal ranges often in excess of 11.0 feet. Average current velocities for the Inner Harbor are less than 0.5 knots. Velocities in other portions of the harbor are generally less than 2.0 knots, with the exception of restricted passages such as between Peddocks Island and Hull where the maximum predicted velocities are in excess of 2.5 knots. Maximum current velocities during spring tide at the areas to be dredged are as follows: 0.1 knot in the Mystic River, 0.2 knot in the Chelsea River, 0.3 knot at the confluence of the Mystic and Chelsea Rivers and 0.7 knot in the President Roads area.

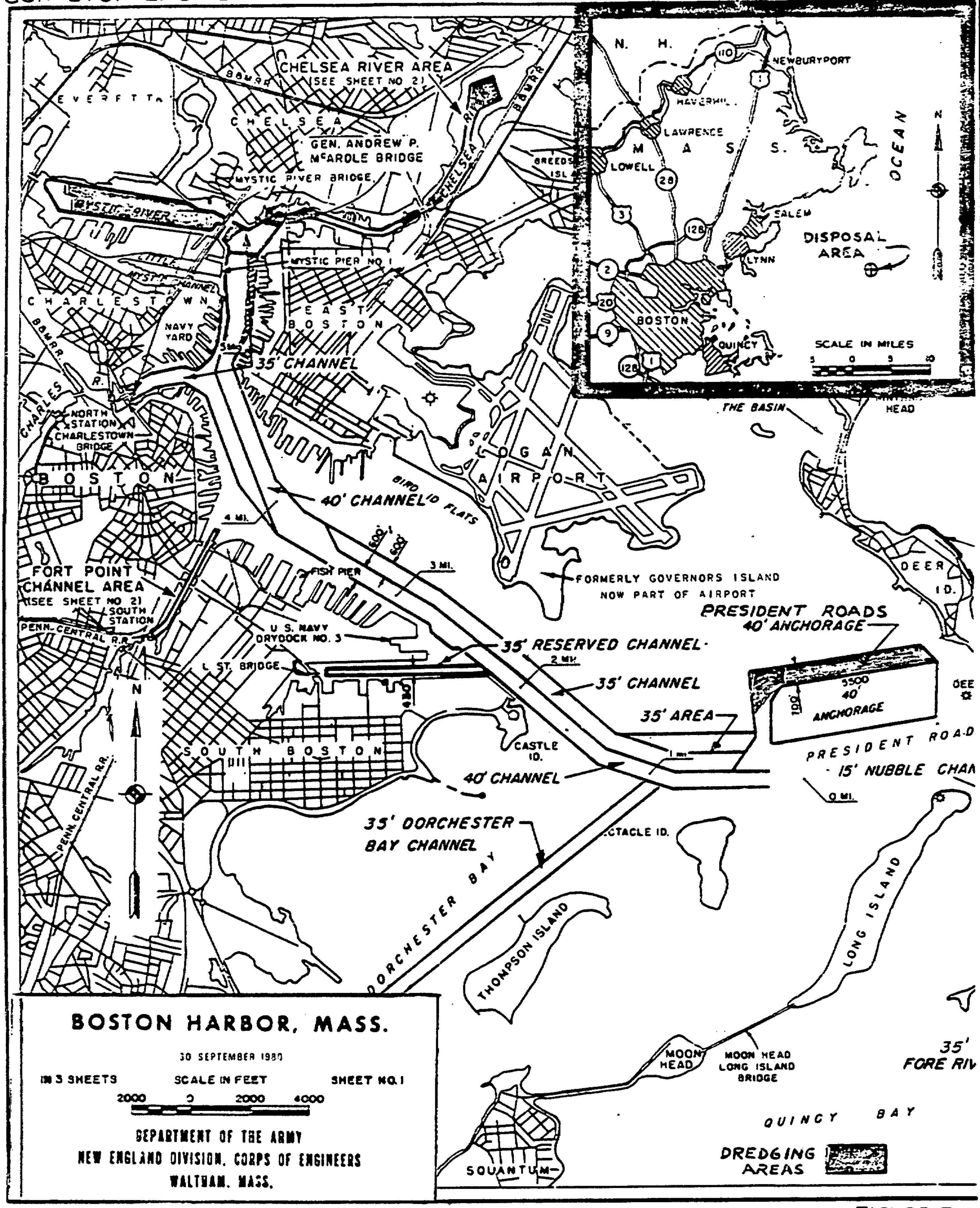

CHELSEA RIVER AREA
(SEE SHEET NO 2)
EVERETT
CHELSEA
GEN. ANDREW P. McARDLE BRIDGE
MYSTIC RIVER BRIDGE
MYSTIC RIVER
LITTLE MYSTIC CHANNEL
MYSTIC PIER NO. 1
CHARLESTOWN
NAVY YARD
EAST BOSTON
35' CHANNEL
NORTH STATION
CHARLESTOWN BRIDGE
BOSTON
LOGAN AIRPORT
BIRD ID FLATS
40' CHANNEL
4 MI.
3 MI.
FISH PIER
FORT POINT CHANNEL AREA
(SEE SHEET NO 2)
SOUTH STATION
PENN-CENTRAL R.R.
U S NAVY DRYDOCK NO. 3
FORMERLY GOVERNORS ISLAND NOW PART OF AIRPORT
PRESIDENT ROADS 40' ANCHORAGE
35' RESERVED CHANNEL
2 MI.
35' CHANNEL
35' AREA
L ST. BRIDGE
SOUTH BOSTON
CASTLE ID.
40' CHANNEL
1 MI.
PRESIDENT ROADS
15' NUBBLE CHAN
0 MI.
35' DORCHESTER BAY CHANNEL
DORCHESTER BAY
THOMPSON ISLAND
LONG ISLAND
MOON HEAD
MOON HEAD LONG ISLAND BRIDGE
35' FORE RIV
QUINCY BAY
SQUANTUM
DREDGING AREAS
DEER ID.
THE BASIN
HEAD
N. H.
NEWBURYPORT
HAVERHILL
LAWRENCE
LOWELL
M A S S.
OCEAN
SALEM
LYNN
DISPOSAL AREA
BOSTON
QUINCY
SCALE IN MILES
BOSTON HARBOR, MASS.
30 SEPTEMBER 1980
IN 3 SHEETS
SCALE IN FEET
SHEET NO. 1
2000 0 2000 4000
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

FIGURE 7

3. Water Quality

The quality of water in Boston Harbor has been the target of considerable expenditures of Federal, State and private funds. Historically, the main contributors to water pollution in the harbor have been raw sewage discharges, combined sewage overflows (CSO's), partial waste treatment and sludge discharges, industrial discharges, urban runoff, oil spills, and poor quality of tributary streams. For the most part, the raw sewage and straight industrial discharges have been rectified as well as present funding and facilities will permit. The present discharge of partially treated sewage and sewage sludges and the CSO's remain the largest water quality problem in the harbor. The history of contamination is found in the harbor sediments which are discussed below.

The inner harbor and the riverine reaches that are planned to be dredged are all classified as SC waters. Such waters are classed as suitable for aesthetic enjoyment, recreational boating, industrial cooling and process use, and as habitat for indigenous wildlife and forage and game fish. The Outer Harbor areas, except for Broad Sound Channels, are classified SB waters. The classification of SB implies suitability for aesthetic enjoyment, habitat for indegenous wildlife and forage and game fish, and the harvesting of shellfish with depuration. The waters in the Broad Sound channel project areas are classified as SA. This classification implies excellent suitability for primary contact sports, excellent fish and wildlife habitiat, and possible approval for shellfish harvesting without dupuration. The assigned classifications, however, do not mean the waters meet the criteria because of the CSO's.

Water quality in Boston Harbor has been found to vary both spatially and temporally. The data contained in Table 1 are a general summary of a recent sampling program.

Barring any localized effects around thermal outfalls from power generating stations, the temperature regime in the harbor is under normal climatic and estuarine controls. The enrichment level in the Outer Harbor is generally considered to be at a mesotrophic scale without excessive primary production (National Commission on Water Quality, 1976). The Inner Harbor is also enriched from combined sewer overflows and the high level of nutrients in the river system feeding the harbor. Dissolved oxygen levels at many locations of the Inner Harbor have been impacted by the basic water quality and primary production, while in the Outer Harbor the oxygen levels have been found to be more dependent on primary production (New England Aquarium, 1973). Salinity data indicate the Outer Harbor to be well mixed, while the various regions of the Inner Harbor are very definitely under the influence of freshwater inputs. Essentially, the mouth of the harbor is considered stenohaline and the Inner and Outer Harbor areas are euryhaline. Oil pollution has created problems in many harbor areas, and a permanent oil boom is maintained at the mouth of Chelsea Creek to protect the remainder of the harbor from potential spills in the main tanker terminal area.

Table 1[1]
Water Quality Data, Boston Harbor

Parameters[2]	River Complex	Outer Harbor	Outside Harbor
Temperature °C.	0-21	0-22	0-20.5
Salinity, ppt	4-32	21-34	28-34
Chemical[2]			
D.O., ppm	2.41-11.49	6.02-14.0	6.48-12.65
Nitrogen mg/l			
Ammonia - N	0.01-1.10	0.01-1.02	0.01-0.40
Nitrate - N	.022-1.24	.001-.570	.002-.940
Organic - N			
Phosphorus mg/l			
Total	0.05-1.02	.024-1.33	.010-.133
Ortho	.007-.924	.010-1.17	.018-.082
Zinc[3] ppm	30.6-62.2	7.8-16.7	
Copper[3] ppm	2.8-6.6	1.9-8.6	
Lead[3] ppm	2.2-10.6	1.2-2.7	
Nickel[3] ppm	7.2-13.6	0.1-13.6	
Chromium[3] ppm	0.2-3.69	0.1-1.2	
Cadmium[3] ppm	0.34-0.56	0.11-1.10	
Biological[2]			
Bacterial cts. (coliform)	0-96,00	0-10,000	0-4,200

(1) Table from Jason Cortell Associates (1977)
(2) New England Aquarium (1973)
(3) New England Aquarium (1972) (values are for soluble phase)

Levels of trace metals in the Inner Harbor have been related to the sewage discharges, CSO's, urban runoff, and the metals contributed by the major rivers. Dorchester Bay has been found to contain the least amount of waterborne trace metals, with the principal source in its inner portion being the Neponset River (New England Aquarium, 1972). In the Outer Harbor, higher levels of metals have been found around the sewage outfalls. In general, the particulate phase contained greater amounts of zinc, nickel, cadmium, copper, and chromium (New England Aquarium, 1972). The New England Aquarium study did not find differences between the particulate and aqueous phases for lead. Seasonal variations were also inferred in the same study and were attributed to spring freshets. The average concentrations of trace metals in the Harbor are presented in Table 1.

The bacterial quality of the harbor waters has been extensively investigated. There are many areas in the Inner and Outer Harbors which are considered grossly contaminated; and, in spite of the water classification of a particular area, the bacterial concentrations limit the harvesting of shellfish. The general densities of total coliform bacteria are indicated in Table 1. The inputs of bacteria are principally attributable to the CSO's and those bacteria surviving treatment plant chlorination. High levels of bacteria have been found in the rivers which drain into the harbor, but the sources have never been documented. It is not unusual for the swimming beaches to be closed following a storm of moderate duration and intensity due to bacterial contamination from the CSO's.

4. Harbor Sediments

Most sediments in Boston Harbor are reworked glacial materials, with the organic fraction in the sediments generally thought to result from industrial and sewage discharges into the harbor. The most prevalent harbor sediment is a plastic clay of glacial origin, known locally as the Boston blue clay. This layer has been detected throughout the harbor in various seismic investigations (Edgerton, 1963 and 1965). The clay is often overlain by more recent sediments, including coarser silts and sands. In several areas, finer grained recent sediments ("muds") contain considerable quantities of gas, with CO_2, CH_4, and H_2S being the most prevalent.

The chemical characteristics of the harbor sediments have been studied in the last decade by the Corps of Engineers, Massachusetts Division of Water Pollution Control, the New England Aquarium and other private groups. The levels of contaminants vary throughout the harbor depending on the type of urban or industrial activities approximate to the sediments. In general, contaminant levels are relatively high in the Inner Harbor and decrease seaward. The levels, however, increase in the President Roads area near the sludge discharge outfall.

Sediment analyses were done in November 1980 by the Corps of Engineers (CE) and are presented in Tables 2, 3 and 4. Sediment samples were collected from four stations in the Mystic River (Figures 1 and 2), the Chelsea River (Figures 3, 4, and 5), and from three stations in the President Roads area (Figure 5).

A fourth station at President Roads (Station A) was supplemented with data collected in 1975.

Sediments at all stations consisted of organic fine sandy or silty clay (60-89% fines) with the exception of Station D in the Chelsea River and Station B in the President Roads area, which were organic silty fine or medium sand (20 - 47% fines).

The chemical characteristics of the sediments can be compared to those found in the Gulf of Maine tidal system. A statistical summary of the Gulf of Maine system may be found in Appendix A. The standard deviation is used to compare relative levels of contamination. A mean greater than two standard deviations (SD) from the Gulf of Maine mean indicates a relatively high level of contamination; a mean between one and two SD indicates a moderate level; and a mean less than one SD indicates a lower level of contamination.

Sediments collected at Station A in the Mystic River contained oil and grease, arsenic, vanadium, greater than two SD from the Gulf of Maine mean. The same sediments also exhibited a volatile solids, chemical oxygen demand (COD), Total Kjeldahl Nitrogen (TKN), arsenic, and cadmium levels between one and two SD. In addition, stations B and C in the Mystic River had arsenic levels between one and two SD and Station C of also had oil and grease in the same range. Station GE-8-80 and C of the President Roads contained TKN levels between one and two SD. All other levels were within one SD of the Gulf of Maine mean.

Table 2
Mystic River

Station	A (PE-6-80)		B (GE-13-80)	C (GE-14-80)	D (GE-12-80)
Depth (ft.)	0.0-1.9	1.19-1.25	Surface	Surface	Surface
Soil Descrip.	Organic Silty Clay	Clay	Organic Fine Sandy Clay	Organic Fine Sandy Clay	Organic Fine Sandy Clay
Medium Grain Size	0.0075	0.0020	0.14	0.0160	0.0270
% Fines	95	98	84	71	61
Liquid Limit	104	48	108	84	73
Plastic Limit	42	24	39	33	29
Plastic Index	62	24	69	51	44
Specific Gravity	2.60	2.74	2.59	-	2.61
Depth	0.0-0.25	1.35-1.60	Surface	Surface	Surface
% Solids	27.28	45.15	40.37	41.99	48.59
Sediment pH	7.0	-	7.5	7.5	7.3
% Vol. Solids EPA	12.06	7.35	9.118.47	6.12	
% Vol. Solids NED	7.78	4.88	5.80	6.28	4.50
Chemical Oxygen Demand (ppm)	212,000	-	102,000	72,100	43,400
Total Kjeldahl Nitrogen (ppm)	6,570	-	3,670	3,510	3,230
Oil and Grease (ppm)	10,500	-	4,690	8,160	6,230
Mercury (ppm)	1.3	0.7	1.7	0.9	0.8
Lead (ppm)	137	111	119	108	77
Zinc (ppm)	224	247	198	154	122
Arsenic (ppm)	22	31	16	16	12
Cadmium (ppm)	6	12	3	3	2
Chromium (ppm)	70	66	183	158	153
Copper (ppm)	116	30	136	136	108
Nickel (ppm)	27	37	58	40	28
Silver (ppm)	220	100	250	250	215
Vanadium (ppm)	414	100	100	100	50
PCB (ppb)	200		-	-	-
DDT (ppb)	1				

Table 3
Chelsea River

Station	A (PE-4-80)		B (PE-5-80)		C (GE-10-80)	D (GE-11-80)
Depth (ft.)	0.0-1.5		0.0-1.0	1.0-1.43	Surface	Surface
Soil Descrip.	Organic Fine Silty Clay		Organic Fine Sandy Clay	Fine Sandy Clay	Organic Fine Sandy Clay	Organic Gravelly Silty Medium To Fine Sand
Medium Grain Size	0.0530		0.0610	0.0500	0.0120	0.20
% Fines	60		64	65	80	20
Liquid Limit	47		44	31	124	40
Plastic Limit	24		25	19	47	29
Plastic Index	23		19	12	77	11
Specific Gravity	2.63		2.66	2.70	2.60	2.65
Depth (ft.)	0.0-0.25	1.40-1.65	0.0-0.25	Surface	Surface	Surface
% Solids	63.04	61.66	54.33	70.78	37.85	61.11
Sediment pH	7.7	0	7.2	-	7.6	7.4
% Vol. Solids EPA	3.7	3.54	4.59	1.93	10.33	4.06
% Vol. Solids NED	2.66	2.46	3.31	1.18	7.66	2.57
Chemical Oxygen Demand (ppm)	60,6000	-	714,000	-	137,000	129,000
Total Kjeldahl Nitrogen (ppm)	2,750	-	2,190	-	4,250	1,580
Oil and Grease (ppm)	2,960	-	4,470	-	2,960	2,110
Mercury (ppm)	0.6	0.5	1.0	0.4	1.0	0.8
Lead (ppm)	45	56	70	26	103	28
Zinc (ppm)	127	167	130	90	238	72
Arsenic (ppm)	8.5	9.6	6.2	4.4	1.3	8.4
Cadmium (ppm)	2	9	3	7	1	1.5
Chromium (ppm)	275	182	175	32	219	61
Copper (ppm)	32	12	43	33	75	20
Nickel (ppm)	42	28	47	38	32	10
Silver (ppm)	118	100	150	100	195	100
Vanadium (ppm)	40	40	40	40	50	40
PCB (ppb)		560	-	-	-	-
DDT (ppb)		6	-	-	-	-

Table 4
President Roads

Station	A (PE-15-76)	B (GE-7-80)	GE-8-80	C
Depth (ft.)	0.0–1.5	Surface	Surface	Surface
Soil Descrip.	Fine Sandy Organic Silt	Organic Silty Fine Sand	Organic Fine Sandy Clay	Organic Fine Sandy Clay
Medium Grain Size	0.0150	0.0730	0.0130	0.0160
% Fines	84.3	47	89	85
Liquid Limit	84	33	92	89
Plastic Limit	38	26	36	35
Plastic Index	46	7	56	54
Specific Gravity	2.59	2.63	2.60	2.57
Depth (ft.)	0.0–0.17	Surface	Surface	Surface
% Solids	39.37	68.35	38.23	48.24
Sediment pH	7.5	6.8	7.2	7.1
% Vol. Solids EPA	9.29	3.10	8.88	7.14
% Vol. Solids NED	7.93	2.12	6.50	4.96
Chemical Oxygen Demand (ppm)	124,000	30,100	114,000	80,700
Total Kjeldahl Nitrogen (ppm)	4,170	1,720	6,600	5,650
Oil and Grease (ppm)	6,800	1,350	4,730	4,320
Mercury (ppm)	1.37	0.7	1.5	1.4
Lead (ppm)	178	25	4.3	43
Zinc (ppm)	306	60	117	153
Arsenic (ppm)	7.6	3.7	7.2	8.3
Cadmium (ppm)	6.1	4	4	1
Chromium (ppm)	335	111	257	225
Copper (ppm)	200	26	64	49
Nickel (ppm)	56	9	22	20
Silver (ppm)	-	150	285	225
Vanadium (ppm)	71	40	40	40
PBC (ppb)	-	1,200	-	-
DDT (ppb)	-	1	-	-

5. Aquatic Resources:

Phytoplankton.

The phytoplankton of Boston Harbor exhibit regional, seasonal and annual changes in species and abundances related to changes in light, temperature, nutrients, water circulation and salinity.

Generally the saltwater populations are dominated by the centric diatoms Skeletonema costata, Detonula confervacea, and Thallissiosira nordenskioldii, whereas freshwater inflows such as in the Mystic River are dominated by the freshwater diatom Asterionella formosa, green algae (Chlorophyceae) or blue-green algae (Cyanophyceae). Phytoplankton densities are generally considered relatively high due to the high organic loads. The Mystic River, Chelsea River and the Inner Harbor areas have higher population levels than the Outer Harbor.

More information on the phytoplankton distribution, abundances, and species may be found in Stewart (1968) and Marine Environmental Services (1970; 1972, a, b, c; 1973; 1976, a, b; 1977, a, b).

Zooplankton

Zooplankton populations also exhibit regional, seasonal and annual differences based on the above stated physical and chemical factors as well as the phytoplankton distribution. Calanoid copepods such as Acartia clausi, A. tonsi, Centropages hamatus, and Eurytemora herdmani are dominant and exhibit seasonal changes during the year. A variety of less abundant zooplankton, planktonic eggs and larvae are also present. A complete list of species and abundances are available in MES (1970; 1972, a, b, c; 1973; 1976, a, b; 1977 a, b).

Benthos

The harbor benthic faunal assembages have been studied in the lower Mystic River and Inner Harbor areas (Stewart 1968; MES 1970; 1972, a, b, c; 1973; 1976, a, b; 1977, a, b). The communities are primarily made up of opportunistic deposit feeders such as polychaetes, amphipods, and shrimp which are associated with the harbor's organic silts. Recent studies have indicated that the lower Mystic River is dominated by the polychaete Capitella capitata (MES, 1977 a, b). Other species were less abundant and are exhibited in Appendix B. Abundances, biomass and diversity of the benthic fauna were highest just below Amelia Earhart Dam and decrease downstream (MES, 1976, 1977, a, b). This was the reverse of previous studies (MES, 1972, a, b; 1973). A similar reverse was exhibited by zooplankton (MES 1977 b). It appears that the benthic communities in the river area are generally unstable due to the strong urban-industrial influence which disturb and/or pollute the sediments.

The fine sediments of the Outer Harbor and presumably the President Roads area have a similar assembly of fauna as in Appendix B. However the sandy areas of the Outer Harbor probably have different benthic assemblages such as listed in Appendix C. Such communities are more associated with coarser sediments typical of high energy currents.

Fisheries

Finfish:

A number of studies on the finfisheries of the Inner and Outer Harbors have been recently accomplished. The MES (1972, 1972 a, b, c; 1973; 1976 a, b; 1977 a, b) and Haedrich and Haedrich (1974) studies have developed information in the Lower Mystic River. Data in the Outer Harbor was developed by Jerome et al (1966), Chesmore et al (1971) and Iwanowicz et al. (1973).

The studies on the Lower Mystic River were concentrated in the area between Amelia Earhart Dam and the Mystic River (Tobin) Bridge. Haedrich and Haedrich (1974) found that the seasonal species composition was similar to other northeast harbor communities. Winter flounder, smelt and alewives are found in the river throughout the year and are, therefore, considered residents. Ocean pout and blueback herring are summer residents, whereas sea herring is considered a winter resident. Other seasonal transients are indicated in Appendix D.

Haedrich and Haedrich (1974) found the major food sources are generally low diversity. Winter flounder feeds mainly on the polychaete *Capatella capitata* and soft shell clams; smelt primarily on sand shrimp (*Crangon septemspinosa*) and other small crustaceans; and alewives and herring on zooplankton.

Information on spawning species, numbers and quality of spawn and their significance to regional resources is imprecise and sketchy. Since the principal streams discharging into the Inner Harbor rivers have dams located in tidal waters and the upstream waters have been of poor quality, significant spawns of smelt and alewives are unlikely. In addition, it is not known if winter flounder use Boston's Inner Harbor for spawning as well as an area of local feeding. From the habits of these fish and from their behavoir in the Mystic River channel area, they appear to stay in particular resident areas within the Inner and Outer Harbors. Larval contribution to the eventual recruitment of these fish in other areas is not known.

Offshore and longshore areas of the harbor were trawled for finfish in the studies done by the Massachusetts Division of Marine Fisheries. Atlantic silverside, mummichog and Atlantic tomcod were the predomininant species found in the longshore trawls. Some of the offshore sampling sites yielded high densities of winter flounder, Atlantic tomcod, four-spine stickleback, and rainbow smelt. The highest densities of finfish were taken during the months of September and October, with Atlantic silverside and winter flounder the predominant species. The densities of finfish dropped during the winter months of December through March as the fish moved offshore to winter feeding grounds.

Shellfisheries:

The softshelled clam (Mya arenaria) is the most important commerical shellfish within the Boston Harbor area. Blue mussels Mytilus edulis) and duck clams (Macoma baltica) are also found in shellfish beds but are not harvested. Densitites of shellfish beds have been documented by the Jerome et al. (1966), Chesmore et al. (1971) and Iwanowicz et al. (1973) and this data should be referred to for detailed information.

Waters overlying the shellfish beds are contaminated by wastes from sewage outfalls, resulting in the presence of coliform bacteria in the shellfish. The beds are under the jurisdiction of Massachusetts DEQE and are closed to commerical and noncommercial harvesting, except by Master Diggers who must have the clams depurated at the Newburyport Shellfish Purification Plant.

Most of the productive softshelled clam beds near the proposed project are closed except for restricted areas near Logan Airport and a seasonal area in Pleasure Bay, the latter located immediately southwest southwest of Castle Island, Logan Airport are one nautical mile north of President Roads and the beds in Pleasure Bay are about two nautical miles west of President Roads. Shellfish beds open to Master Diggers are created within the lower bays and are substantially distant from the shipping channels.

The limited amount of lobstering within the Boston area takes place primarily in Quincy, Dorchester and Hingham Bays. Lobstering is minimal or nonexistent in the areas to be primarily affected by the proposed work with the exception of the President Roads area where activities will be coordinated with the fishery.

B. The Foul Area Ocean Disposal Site (Boston Foul Area)

1. General

At the present time, the closest EPA designated ocean disposal site (Environmental Protection Agency (EPA), 1977) for contaminated waste is the "Boston Foul Area" (see Figure 8). The Foul Area is approximately two miles in diameter and is located 22 nautical miles east of Boston with its center at latitude 42°25'N, longitude 70°35'W. The site has a history of being used for the disposal of dredged materials and industrial wastes. Physiographically, the site lies within the Stellwagen Basin, an elongate depession over 20 miles in length which trends northwest-southeast (Figure 8). The dump site is situated in a 300 foot-depression which is separated from the Stellwagen Bank area on the east by a 200-foot high slope.

Schlee et al. (1974) have characterized the bottom sediments of much of the area as clayey silts. Holocene sediments thicknesses in the Foul Area average in excess of 130 feet.

Bottom currents in the basin and at the Foul Area specifically have been investigated by Butman (1973), Bumpus (1974), Halpern (1971), and the New England Aquarium (NEA, 1975). Maximum velocities on the bottom at the Foul Area (measured one meter off the bottom) have been reported at 0.8-1.0 feet per second (26-29 cm/sec). Current monitoring during 1974 was carried out by the New England Aquarium (1975). Mean bottom currents reported were between 0.13 and 0.16 feet per second (4-5 cm/sec) with maximum bottom currents averaging 0.5 feet per second (16 cm/sec). Work by Butman (New England Aquarium, 1975) has shown that during winter storms bottom currents (opposite in direction to wind direction) were of sufficient magnitude to potentially move suspended solids 12.5 miles (20 km). Bumpus (1974) indicates that net drift in this area is shoreward. The NEA has summarized seaward current trends, based on 1974 current meter data as follows:

Winter Towards SE	Summer - W
Spring Towards S or W	Fall -N

These are average directions, however, and storm activity can modify these on a seasonal basis.

2. Water Quality

The water quality of the Foul Area has been evaluated by the New England Aquarium (1975). The data gathered indicate that the temperature regime is seasonally dependent, with a thermocline developing during late April and May and weakening during the late fall. At that time a 13.5°C temperature difference was noted in the water column. Data for salinity showed little change during the fall and winter, but a decline during the spring was noted presumably due to fresh water unputs from the Merrimack River. The background salinity for the area is 32.2 ppt. Dissolved oxygen levels were found to be influenced by the various periods of primary production and plankton die-off. The lowest concentration was noted to be 6.82 mg/l at the surface during April. The fall decline throughout the water column is attributed to increased levels of respiration while the influence of the spring and summer blooms are clearly evident. During the summer, oxygen levels have been noted to be above saturation at some locations. The nutrient relationships also reflect the influence of phytoplankton growth and die-off, particulary as the level of phosphorus declines sharply and the nutrient becomes limiting in the trophogenic zone. There are rising concentrations of nutrient material during the summer below the thermocline, and increased concentrations of ammonia have been found at the bottom of the water columns during disposal of dredged material. Average annual nurtient levels are indicated in Table 5.

The average annual metal levels for the Foul Area waters are also exhibited in Table 5 (New England Aquarium, 1975). With the exception of periods during which dredged material was being dumped; trace metal levels were within acceptable levels. Lead did, however, reflect some seasonality, and significant differences in the concentrations of other metals were detected between stations and at certain depths.

3. Sediments

Sediments in the Foul Area are primarily composed of fine grained silts and clays with some sand and gravel in the northeast portion of the area. Acoustic profiling of the areas in Stellwagen Basin, where the Foul Area is located, indicates that thick deposits of recent sediments are accumulating in the basin. It is thought that the basin is a natural sediment sink for fine grained terrigenous sediments from the Massachusetts coast, perhaps from as far away as the Merrimack River.

The chemical properties of the Foul Area sediments also were documented by the New England Aquarium (1975). Reasonable consistencies were found in the concentrations of some metals between the sample locations. There were others, however, that varied by several orders of magnitude. The average chemical characteristics of the Foul Area sediments are presented in Table 6. By comparison with Boston Harbor it can be seen that the sediments have a relatively moderate to high level of volatile solids but a low level of oil and grease.

There are also low concentrations of mercury, lead, zinc, chromium, copper and vanadium. The concentrations of nickel, cadmium, and arsenic are moderate to high in relation to the Boston Harbor project areas. In comparison to other marine environs, such as Buzzards Bay (Table 6), the trace metal levels at the Foul Area are elevated over what could be considered background concentrations commensurate with the hydrogeological regimes of the area.

TABLE 5
Water Quality of Boston Foul Area 1973-1974*

	Minimum	Annual Mean	Maximum
Nitrate N (ppm)	<.001	0.003	0.010
Nitrate N (ppm)	<.0001	0.105	0.260
Ammonium N (ppm)	<.022	0.045	0.112
Ortho Phosphate (ppm)	<.001	0.025	0.050
Lead (ppm)	<.1	2.3	1.4
Zinc (ppm)	2	21	69
Cadmium (ppm)	<.05	0.3	1.0
Chromium (ppm)	<.1	0.4	1.1
Copper (ppm)	.3	2.3	7.0
Nickel (ppm)	.2	1.8	6.5

*Data from New England Aquarium (1975)

Table 6
Comparison of the Sediment Quality of Boston Foul Area
With Boston Harbor and Buzzards Bay Sediments

Location	Composite of Boston Harbor Sediments (1)	Composite of Boston Foul (2)	Buzzards Bay (3)
Soil Descrip.	Silty Clay	Silty Clay	-
% Vol. Solids EPA	7.39	7.62	4.2
Oil and Grease (ppm)	5,913	940	195
Mercury (ppm)	1.0	0.59	0.21
Lead (ppm)	88	60.94	22.8
Zinc (ppm)	165	140.44	75.1
Arsenic (ppm)	14.2	13.25	2.8
Cadmium (ppm)	4.3	3.43	1.6
Chromium (ppm)	138	73.75	29.1
Copper (ppm)	89.7	21.13	10.9
Nickel (ppm)	30.8	37.56	20.0
Silver (ppm)	189.4	-	-
Vanadium (ppm)	114	53.69	47.5
PCB (ppm)	420	52.13	193.00

(1) Corps of Engineers, 1980 data
(2) New England Aquarium (1975)
(3) Summerhayes (1977)

4. Aquatic Resources

Benthos

Biological data on the Foul Area were collected by the New England Aquarium (1976) as part of a study of polluted materials in Massachusetts Bay. Most of the bottom sediments in the foul area are of clayey silt composition, so that organisms which typically inhabit this substrate were detected in the sampling. Polychaete worms dominated two replicate samples with *Prionospio malmegereni*, *Spio filicornis*, and *Heteromastus filiformis* being the most abundant. A bivalve (*Thayasira*) occurred in 75% of the samples.

In addition to these benthic organisms, shrimp, flounder, and starfish were found at the site.

The faunal assemblages at the Foul Area were studied by the New England Aquarium (1975). The Foul Area showed low abundances and high diversities of marine invetebrates. Most of the stations within the Foul Area were reflective of sightly altered conditions due to a history of dredged material disposal. The most dominant organisms were the polychaete worms, *Spio filicornis* and *Heteromastus filiformus*. The dominant organisms of the Foul Area were similar to organisms found in areas with similar sediment composition in other sections of Massachusetts Bay (New England Aquarium, 1976). However, the total numbers of individuals at the Foul Area were low compared to other areas. As an example, 52-123 individuals were obtained with a 0.1m^2 grab at the stations within the Foul Area, while 178 to 1,365 at stations outside of the Foul Area were obtained. Although the Foul Area has a high diversity of organisms, the low abundances leads one to believe the area does not add a large amount to the overall productivity of Massachusetts Bay.

Fisheries

Stellwagen Basin contains food and spawning habitat for a variety of marine fisheries which are utilized by commercial and recreational interests. Data from trawls in the area indicate that the dominant species are Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), white flounder (*Pseudopleuronectes americanus*) and little skate (*Raja erimacea*) (National Marine Fisheries Service, personal communication). Other important species include yellowtail flounder (*Limandos ferruginea*), silver hake (*Merluccius bilinearis*), American plaice (*Hippoglossoides platessoides*), and pollack (*Pollachius vivens*). Most fishermen avoid the immediate Foul Area because of the debris and pollution from previous disposal operations.

Endangered Species

Data from an annual report prepared for the Bureau of Land Management indicates that Stellwagen Bank (east of the Foul Area) is currently used by two species of turtles and three species of whales (URI, 1981). The leatherback turtle (Dermochelys coriacea) and the loggerhead turtle (Caretta caretta) are designated by the National Marine Fisheries Service (NMFS) as endangered and threatened, respectively. All three species of whales, the humpback, (Megaptera novaengliae), the finback whale (Baleanoptera physalus), and the right whale (Eubalaena glacialis) are all designated as endangered. NMFS has indicated that the Stellwagen Bank is extensively used as a feeding ground by the humpback and finback whales from May through October. On the other hand, sitings of the leatherback and loggerhead turtles and the right whale are rare in the area.

Siting information in the affected area has been documented by the University of Rhode Island (URI, 1981). Review of the data indicates that within a 75 square nautical mile area surrounding the Boston Foul Area (70° 30' - 40'W and 42° 20' - 30'N), only two sitings of whales were made during the year 1979 (Figure 8). The sites were 2.4 and 3.7 nautical miles northeast and east of the disposal site buoy, respectively. Both were verified as finback whales. No humpback or right whales were sighted in the 75 square mile area. Sitings were more common along the Stellwagen Bank area, east of the dump site, where the major food species, the sand lance (Ammodytes americanus) has suitable habitat (clean sand and fine gravel). This area is separated from the dump site by the previously mentioned slope.

V. ENVIRONMENTAL CONSEQUENCES

A. Impacts of Dredging

1. The Action of Dredging

Dredging of the Mystic and Chelsea Rivers and the President Roads Anchorage area will be accomplished by a clamshell dredge. The sediments are excavated from the bottom by a jaw shaped apparatus called a clamshell, which is operated by a crane mounted on a barge, and then deposited into the scow for transport to the disposal site. Each load is picked up as one cohesive mass and thus allows for minimal dispersion of the sediments into the water column. The resulting alteration of the aquatic environment and its impacts on the aquatic resources are discussed below.

2. Alteration of the Environment

a. Water Quality

The act of dredging suspends and exposes the dredged sediments and its constituents to the water column (see above). The result is a temporary increase in turbidity and oxidation and solution of sediment contaminants.

i. Turbidity

Turbidity levels during clamshell dredging increase primarily as a result of the dredge disturbing the bottom sediments and through bucket loss. Because of the differences in sediment characteristics, ambient currents and skill differences among dredge operators, it is difficult to determine precisely the amount of turbidity that will be generated by dredging.

Studies by Bohlen _et al_. (1979) were done during the dredging of the Thames River estuary in New London, Connecticut, partly to estimate the magnitude and character of clamshell dredge-induced sediment resuspension. Approximately 1.5 to 3% of the sediment volume of each bucketload was introduced into the water column, producing suspended material concentration adjacent to the dredge of 200 - 400 mg/l. These levels exceeded background levels by two orders of magnitude and were nearly an order of magnitude less than storm-wave-induced suspension. The sediments of the Thames River estuary were similar to those of Boston Harbor.

Once in suspension, the sediments settle out according to particle sizes. Physical properties of the sediment and seawater may be used to predict the time it takes for the suspended solids to settle out. Jason Cortell Associates (1977) compared the settling times for various reaches of Boston Harbor dredged sediments for the Corps of Engineers (Table 7). The settling times in Table 7 indicate that 75% of the sediment (by weight) will have settled between 1/2 to 21 days after dredging. The majority of this fraction (50% of 75%) would have settled in 1.5 hours to 93 hours. The very fine sediment fractions would take longer.

Table 7
Settling Times and Net Movement of Sediments Dredged in Boston Harbor

Location	Settling Time (hrs)		One Spring Tidal Cycle (yards)
	50% of Sediments	75% of Sediments	
Mystic River	93	495	298 (Ebb Tide)
Chelsea River	1.5	13.3	1,500 (Ebb Tide)
President Roads	5.8	222	1,650 (Flood Tide)

Once suspended in the water column the sediment particles may move according to the current present at the time of dredging. The distances of net movement during spring tides at the dredge site have been calculated by Jason Cortell Associates (1977) (Table 7). Movement would not be more than approximately 300 yards for the Mystic River, 1,500 yards for the Chelsea River and 1,650 yards for the President Roads area. In most cases, turbidity levels at these distances may be within the range of natural variations in turbidity.

ii. Release of Contaminants

The immediate problem facing dredging and dredged material disposal is the question of increased availability of metals and other constituents that may have a deleterious impact on water quality and on the marine biota. Estuarine sediments, which are usually fine-grained and highly organic, serve as a sink for a variety of heavy metals and other pollutants, resulting in their accumulation. Any release of heavy metals and other pollutants from sediments upon dredging is an extremely complex process that is affected by numerous environmental variables including pH, dissolved oxygen, chemical characteristics of the intertidal waters, physical and chemical states of the pollutants and sediment gain size.

Since bucket dredges normally operate quite efficiently, i.e., only a small fraction of the dredge material escapes into the water column, there would be little opportunity for significant contamination of the harbor waters. In fact, heavy metal concentrations may even decrease, in some cases, due to absorption onto suspended silt and clay particles.

The general consensus of people investigating metal release during resuspension of bottom materials indicates that there is no blanket or extensive release of metals from dredged materials. Even though metals are found in the sediments, their total concentrations do not determine the transfer of metals across the sediment-water interface. Bulk chemical analysis alone is not adequate to determine potential releases and impacts of a metal (Lee _et al_., 1976; Hirsh, DiSalvo and Peddicord, 1978).

Studies on metal transport under dredging conditions report that there is no substantial release of metals. Their mobility is restricted since they are not readily soluble and would be adsorbed to sediments, coprecipitated out of solution or incorporated with iron oxides or sulfide bearing sediments (Lee and Plumb, 1974; Chen et al., 1976; Burks and Engler, 1978).

The primary chemical effect at the dredge sites would be associated largely with exposing anaerobic bottom sediments. Their exposure would cause the reduced chemical compounds to exert an immediate oxygen demand on the overlying waters. Coupled with the oxygen already being consumed for biological respiration and the decomposition of organic material, dissolved oxygen levels would be depleted in the primary impact areas. Low oxygen levels in combination with other dredging effects may be sufficient to produce enough stress in portion so the aquatic community to result in sporadic fish kills. However, since the disturbance would be limited to small bottom areas at any one time, tidal flows bringing well-oxygenated waters into the harbor would tend to reduce the duration and severity of these effects. In addition to oxygen depletion, dredging anaerobic sediments may liberate hydrogen sulfide gas, temporarily causing some unpleasant odors.

Potential release of sediment contaminants into the water column may be evaluated by use of the standard elutriate test as outlined in the Ecological Evaluation of Proposed Discharge of Dredged Materials into Ocean Waters (Environmental Protection Agency (EPA)/Corps of Engineers (CE), 1977). Here, the sediment is mixed with four parts seawater and shaken for 30 minutes. After settling for one hour the filtered elutriate is analyzed for sediment contaminants. Levels of contaminants are compared with levels in a water sample taken from the dredged or disposal site. (The one-to-four sediment-water ratio was designed to simulate worst case mixing which would occur during hydraulic dredging. Since the clamshell dredge will be used in this case, mixing would not occur to the degree exhibited by the elutriate tests. The sediment generally remains together as a more cohesive mass which reduces exposure to the water column.)

Elutriate tests were performed on sediment taken from the Mystic and Chelsea Rivers and the President Roads area of Boston Harbor. The results are shown in Tables 8, 9 and 10. Three replicate tests (R1, R2, and R3) were done on each sediment sample The locations of the samples are shown in Figures 1 - 6.

The data in Tables 8, 9 and 10 indicate potential releases of ammonia nitrogen, oil and grease, lead, zinc, nickel and polychlorinated biphenyls (PCB's) from the Mystic River sediments; ammonia nitrogen, lead, zinc, copper nickel and PCB's from the Chelsea River station; and ammonia nitrogen, phosphorous oil and grease, mercury, zinc, arsenic and PCB's from the President Roads area.

Release of nutrients, such as nitrogen and phosphorous would be localized and temporary and may lead to increased biological oxygen demand. This would not lead to further eutrophication of the Harbor areas. Comparison of the values in Tables 8, 9 and 10 with recent EPA criteria for saltwater (EPA 1980), indicate that releases of mercury, lead, zinc, arsenic, copper, and nickel were all within acceptable limits. In contrast, PCB concentrations were above the water quality guidelines of 0.03 ppb average for a 24-hour period (EPA, 1980); no guidelines have been established for an instantaneous release although toxicity occurs above 10 ppb. However, the concentrations exhibited in Tables 8, 9 and 10 would not likely to occur during clamshell dredging. In addition, the large volumes of flowing water at the dredge site are likely to continually dilute these concentrations below toxic levels, if not the 24-hour average.

Monitoring of PCB concentrations during disposal operations in Puget Sound indicated that concentrations returned to backround levels shortly after disposal operations ceased (Wright, 1978).

Table 8

Elutriate Testing
Mystic River, MA - April 1981

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from each sampling location and (2) the virgin water from each sampling location as as follows:

Test Property	Designation and Dredge Site Water Location A EW-6-81	Standard Elutriate Sediment Depth Used in Preparation Location A PE-6-81/0.0-1/4 ft.			Designation and Dredge Site Water Location D EW-12-81	Standard Elutriate Sediment Depth** Used in Preparation Location D GE-12-81		
		R1*	R2	R3		R1	R2	R3
Nitrite nitrogen (N), ppm	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate nitrogen (N), ppm	0.13	0.01	0.06	0.13	0.11	0.03	0.03	0.03
Ammonia nitrogen (N), ppm	<0.5	10	2	5	<0.5	0.7	1.1	0.7
Sulfate (SO_4), ppm	3,240	2,550	2,430	2,480	3,340	2,850	2,870	2,900
Oil and Grease, ppm	<0.5	0.9	1	1	<0.5	<0.5	<0.5	<0.5
Phosphorus (P)								
ortho, ppm	0.6	<0.1	<0.1	<0.1	0.05	0.01	<0.01	<0.01
total, ppm	0.05	<0.1	<0.1	<0.1	0.05	0.01	<0.01	<0.01
Mercury (Hg), ppb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead (Pb), ppb	14	15	17	15	7	15	10	10
Zinc (Zn), ppb	100	20	50	100	1	20	20	50
Arsenic (AS), ppb	<1	<1	<1	<1	<1	<1	<1	<1
Cadmium (Cd), ppb	25	3	<0.5	<0.5	9	<0.5	<0.5	10
Chromium (Cr), ppb	<4	<4	<4	<4	<4	6	<4	<4
Copper (Cu), ppb	6	<2	<2	<2	2	2	2	2
Nickel (Ni), ppb	30	20	20	20	10	30	30	10
Silver (Ag), ppb	<80	<80	<80	<80	80	80	80	80
Vanadium (V), ppb	<40	<40	<40	<40	60	<40	<40	<40
Total PCB, ppb	0.015	13.2	13.2	9.2	<0.001	0.91	0.97	0.76
Total DDT, ppb	0.001	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001

Table 8 (Continued)

Elutriate Testing
Mystic River, MA - April 1981

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from each sampling location and (2) the virgin water from each sampling location as as follows:

Test Property	Dredge Site Water Location B EW-13-81	Standard Elutriate Designation and Sediment Depth** Used in Preparation Location B GE-13-8		
		R1	R2	R3
Nitrite nitrogen (N), ppm	<0.005	<0.005	<0.005	<0.005
Nitrate nitrogen (N), ppm	0.12	0.03	2.10	1.06
Ammonia nitrogen (N), ppm	0.5	1.1	1.3	1.5
Sulfate (SO_4), ppm	3,500	2,850	2,830	2,760
Oil and Grease, ppm	0.6	<0.5	<0.5	0.6
Phosphorus (P)				
ortho, ppm	0.05	0.01	0.02	0.02
total, ppm	0.05	0.01	0.02	0.02
Mercury (Hg), ppb	0.9	<0.5	<0.5	<0.5
Lead (Pb), ppb	4	7	4	14
Zinc (Zn), ppb	40	80	15	25
Arsenic (AS), ppb	<1	<1	<1	<1
Cadmium (Cd), ppb	16	20	<0.5	<0.5
Chromium (Cr), ppb	<4	<4	<4	<4
Copper (Cu), ppb	6	<2	<2	<2
Nickel (Ni), ppb	20	20	30	30
Silver (Ag), ppb	<80	<80	<80	<80
Vanadium (V), ppb	<40	<40	<40	<40
Total PCB, ppb	-	-	-	-
Total DDT, ppb	-	-	-	-

*R_1, R_2 and R_3 - Replicate determinations
**Surface grab sample only

Table 9

Elutriate Testing
Chelsea River, MA - April 1981

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from each sampling location and (2) the virgin water from each sampling location as as follows:

Test Property	Dredge Site Water Location A EW-4-81	Standard Elutriate Designation and Sediment Depth Used in Preparation Location A PE-4-81; 0.0-1/4 ft.			Dredge Site Water Location C EW-10-81	Standard Elutriate Designation and Sediment Depth* Used in Preparation Location C GE-10-81		
		R1**	R2	R3		R1	R2	R3
Nitrite nitrogen (N), ppm	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite nitrogen (N), ppm	0.17	0.10	0.10	0.09	0.09	<0.01	0.01	0.04
Ammonia nitrogen (N), ppm	1.2	20	6	4	<0.5	6.6	2.4	12.7
Sulfate (SO_4), ppm	3,230	2,540	2,520	2,590	3,260	2,300	2,290	2,550
Oil and Grease, ppm	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5
Phosphorus (P)								
ortho, ppm	0.06		0.01	0.01	0.06	0.01	0.03	0.02
total, ppm	0.06	0.02	0.01	0.01	0.06	0.02	0.03	0.03
Mercury (Hg), ppb	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lead (Pb), ppb	14	15	12	17	14	17	13	15
Zinc (Zn), ppb	100	40	65	65	2	15	35	35
Arsenic (AS), ppb	<1	3.3	<1	<1	<1		5.3	<1
Cadmium (Cd), ppb	13	<0.5	<0.5	<0.5	9 to 24	<0.5	<0.5	<0.5
Chromium (Cr), ppb	<4	<4	<4	<4	<4	<4	<4	<4
Copper (Cu), ppb	5	<2	<2	<2	<2	<2	5	6
Nickel (Ni), ppb	30	<5	<5	<5	10	10	20	20
Vanadium (V), ppb	<80	<80	<80	<80	<80	<80	120	90
Total PCB, ppb	<0.001	0.56	0.42	0.52				
Total DDT, ppb	<0.001	<0.001	<0.001	<0.001				

Table 9 (Continued)

Elutriate Testing
Chelsea River, MA - April 1981

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from each sampling location and (2) the virgin water from each sampling location as as follows:

Test Property	Dredge Site Water Location D EW-11-81	Standard Elutriate Designation and Sediment Depth** Used in Preparation Location D GE-11-81		
		R1	R2	R3
Nitrite nitrogen (N), ppm	<0.005	<0.005	<0.005	<0.005
Nitrate nitrogen (N), ppm	0.12	0.03	0.03	0.01
Ammonia nitrogen (N), ppm	0.5	0.8	1.4	0.9
Sulfate (SO_4), ppm	3,360	2,630	2,610	2,640
Oil and Grease, ppm	0.6	<0.5	<0.5	<0.5
Phosphorus (P)				
ortho, ppm	0.06	0.01	0.02	0.01
total, ppm	0.06	0.01	0.02	0.01
Mercury (Hg), ppb	<0.5	<0.5	<0.5	0.1
Lead (Pb), ppb	10		15	15
Zinc (Zn), ppb	1	10	25	45
Arsenic (AS), ppb	<1	<1	<1	<1
Cadmium (Cd), ppb	9	10	4	<0.5
Chromium (Cr), ppb	<4	<4	<4	6
Copper (Cu), ppb	11	2	3	3
Nickel (Ni), ppb	10	20	10	30
Silver (Ag), ppb	<80	<80	110	<80
Vanadium (V), ppb	<40	<40	<40	<40
Total PCB, ppb	0.001	0.10	0.05	0.09
Total DDT, ppb	<0.001	<0.001	<0.001	<0.001

*R_1, R_2 and R_3 - Replicate determinations
**Surface grab sample only

Table 10

Elutriate Testing
President Roads, Boston Harbor, MA - April 1981

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from each sampling location and (2) the virgin water from each sampling location as as follows:

Test Property	Dredge Site Water Location B EW-7-81	Standard Elutriate Designation and Sediment Depth* Used in Preparation Location B GE-7-81			Dredge Site Water Location EW-8-81	Standard Elutriate Designation and Sediment Depth* Used in Preparation Location GE-8-81		
		R1**	R2	R3		R1	R2	R3
Nitrite nitrogen (N), ppm	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite nitrogen (N), ppm	0.07	0.03	0.02	0.01	0.05	<0.03	0.03	0.03
Ammonia nitrogen (N), ppm	<0.5	2	2	3	<0.5	6	5	4
Sulfate (SO_4), ppm	3,470	2,960	2,620	2,640	3,480	2,550	2,520	2,570
Oil and Grease, ppm	<0.5	1	0.9	<0.5	<0.5	<0.5	1	1
Phosphorus (P)								
ortho, ppm	0.03		0.01	0.01	0.06	0.01	0.03	0.02
total, ppm	0.03	0.02	0.01	0.01	0.06	0.02	0.03	0.03
Mercury (Hg), ppb	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lead (Pb), ppb	17	15	12	17	14	17	13	15
Zinc (Zn), ppb	45	40	65	65	2	15	35	35
Arsenic (AS), ppb	<1	3.3	<1	<1	<1		5.3	<1
Cadmium (Cd), ppb	12	<0.5	<0.5	<0.5	9 to 24	<0.5	<0.5	<0.5
Chromium (Cr), ppb	<4	<4	<4	<4	<4	<4	<4	<4
Copper (Cu), ppb	9	<2	<2	<2	<2	<2	5	6
Nickel (Ni), ppb	20	<5	<5	<5	10	10	20	20
Silver (Ag), ppb	<80	<80	<80	<80	<80	<80	120	90
Vanadium (V), ppb	<40	<40	<40	<40	<40	<40	<40	<40
Total PCB, ppb	<0.001	0.26	0.34	0.37	-	-	-	-
Total DDT, ppb	<0.001	<0.001	<0.001	<0.001	-	-	-	-

Table 10 (Continued)

Elutriate Testing
President Roads, Boston Harbor, MA - April 1981

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from each sampling location and (2) the virgin water from each sampling location as as follows:

Test Property	Dredge Site Water Location C EW-9-81	Standard Elutriate Designation and Sediment Depth* Used in Preparation Location C GE-9-81		
		R1	R2	R3
Nitrite nitrogen (N), ppm	<0.005	<0.005	<0.005	<0.005
Nitrate nitrogen (N), ppm	0.03	0.03	0.03	0.03
Ammonia nitrogen (N), ppm	0.5	3.0	2.9	3.1
Sulfate (SO_4), ppm	3,470	2,730	2,620	2,740
Oil and Grease, ppm	<0.5	1.0	0.8	0.7
Phosphorus (P)				
ortho, ppm	0.04	0.01	0.03	0.02
total, ppm	0.04	0.04	0.05	0.07
Mercury (Hg), ppb	0.5	<0.5	<0.5	<0.5
Lead (Pb), ppb	17	22	12	13
Zinc (Zn), ppb	145	25	70	15
Arsenic (AS), ppb	<1	1.3	1.3	<1
Cadmium (Cd), ppb	14	5	<0.5	<0.5
Chromium (Cr), ppb	<4	<4	<4	<4
Copper (Cu), ppb	10	<2	<2	<2
Nickel (Ni), ppb	30	10	10	<5
Silver (Ag), ppb	<80	<80	<80	<80
Vanadium (V), ppb	<40	<40	<40	<40
Total PCD, ppb	-	-	-	-
Total DDT, ppb	-	-	-	-

*R_1, R_2 and R_3 - Replicate determinations
**Surface grab sample only

3. Impact on Organisms

a. Physical Effects

i. Removal of Benthos

The benthic organisms associated with the sediments to be dredged will be destroyed during the dredging process and removed from the site. The affected organisms are listed in Appendicies B and C and include benthic invertebrates such as polychaetes, amphipods and shrimp. These serve as a source of food for crabs and finfish. More motile forms such as fish would avoid the work area and should not be seriously affected. The loss of forage for predators would be temporary because the dredged areas would be recolonized within a few months after dredging. Some of the more opportunistic species such as Capitella and Nepthys would be the first recolonizing organisms. The removal of contaminated sediments may provide more suitable habitat for organisms such as amphipod and bivalves.

ii. Turbidity

Increased suspended sediments in the water column would decrease light transmittance through the water column. This and burial of benthic algae would decrease general photosynthetic activity in the dredged areas. This effect would be temporary and entirely local. The areas affected by dredging provide a small portion of the habitat available to widely distributed populations.

Most of the adult benthic organisms are polychaete worms associated with fine sediments which are continually disturbed by harbor activities. The turbidity generated from dredging should have an imperceptible impact on organisms such as these. The polychaete worms are primarily deposit feeders. It has been found that their feeding activity reworks fine grained-sized sediments, producing a granular surface which is easily resuspended by low velocity currents (Rhoads and Young, 1970). Therefore, these organisms are able to withstand extended periods of turbidity.

It would appear that filter feeding organisms such as bivalve molluscs would be more sensitive to increased suspended solids because of the nature of their feeding and respiratory mechanisms. However, review of the literature indicates that bivalves exhibit low mortality due to increased suspended solids from dredging operations (Stern and Stickle, 1977). In addition a report done for the Massachusetts Department of Natural Resources (1973) found filter-feeders such as quahogs, soft-shelled clams, and Atlantic oysters were not affected by 48- and 96-hour sediment concentrations of 83.2 grams per liter. These values simulate the effects of the worst case turbidity from dredging activities. Therefore, harm to filter-feeders is not likely to occur.

The increased turbidity may be detrimental to sensitive eggs, larvae, juveniles of invertebrates or fishes in the dredgings areas. The settlement of suspended sediments may also bury these life stages. For example, demersal finfish eggs such as those of the winter flounder (Pseudopleuronectes americanus) cannot withstand burial under more than a few millimeters of material. Life-sustaining functions occur at the egg surface and water interface. Burial by sediment impedes gas exchanges and traps toxic materials next to the egg, eventually killing the organism.

Some impact to the resident seasonal finfishes of the Mystic and Chelsea Rivers area may occur. Dredging within the river channels may inhibit organisms such as winter flounder and ocean pout from swimming upstream past the operation. Seasonal movements of anadromous species such as alewives and smelt may also be affected. However, the relative lack of significant upstream spawning habitat for these species compared with other harbors, rivers and coastal inlets in the region reduces the need for measures to mitigate impacts.

b. Chemical Effects

The chemical effects on organisms in the dredging areas would be minimial. The elutriate tests indicated that the concentration of heavy metals release to the water column (i.e., available to aquatic organisms) were below the water quality criteria established by EPA. The elutriate test did indicate release of PCB's above the 24-hour average standard. However, as stated above, releases from clamshell dredging would be lower than those indicated in the elutriate test. In addition, the release that will occur will be diluted by large volumes of continually flowing water at the dredge sites. If PCB's were accumulated by organisms in the vicinity of the dredging sites, recent studies have shown that the accumulation would be temporary. Arimoto and Feng (1980) found that the PCB concentrations in mussels near a disposal site in New London, Connecticut, increased during disposal operations but decreased soon after disposal operations ceased. Studies in Puget Sound, Washington, where PCB sediment concentration were high beause of a previous spill, showed similar results (Wright, 1978).

B. Impacts Of Disposal

1. The Action of Disposal

The dredged material is released through bottom opening doors in the scows and deposited at the dump site. The movement of sediments through the water column has been described by Gordon (1977). Briefly, upon release from the scow, the dredged material generally descends rapidly to the bottom. The speed of decent and the size of the bottom spreading depends on many factors, including the mechanical properties of the sediment, water percentage of the sediment, depth, bottom conditions, ambient currents, etc. Gordon also indicates that ambient current conditions are important because such a large volume of ambient water is collected during descent that the material flow will acquire the ambient lateral velocity of the water. Upon impact, a turbidity (density driven) current will be set up which will spread outward until friction forces cause it to halt.

2. Alteration of the Environment

a. Water Quality.

The impacts of the water quality associated with dredged material disposal are a temporary and local increase in suspended solids and sediment contaminants.

i. Turbidity.

Release of the dredged material would create a turbidity plume of fine loose and clumped material into the water column. Studies during disposal at the Boston Foul Area by New England Aquarium (1975) indicated that suspended solids were highest near the bottom of the water column. However, the levels of turbidity did not adversely affect primary production. Gordon (1974) found that only 1% of the total volume of dredged material at a site in Long Island Sound remained suspended in the water column after disposal.

ii. Release of Contaminants

The mixing of the anoxic sediments during descent and impact on the bottom may release nutrients, petroleum hydrocarbons, metal and chlorinated hydrocarbons into the water column. The discussion of potential release of contaminants during dredging (Section A1b) would also apply to disposal. Briefly, elutriate testing indicated worst case potential release of ammonium nitrogen, phosphates, oil and grease, mercury, zinc, lead, arsenic and PCB's. The nutrient releases were marginal which may cause only localized increases in phytoplankton productivity. Metal releases were all within EPA guidelines.

Release of PCB's were above the 24-hour average (0.03 ppb) (EPA 1980). However, this level is a worst case estimate because: (1) a clamshell dredge will be used which will minimize mixing of sediments within the water and (2) dilution by the water column during disposal would probably reduce levels down to acceptable standards. The elutriate test indicated that Station A sediments of the Mystic River showed the highest release of PCB's, 13.2 ppb. Formula "H5" in Appendix H of the EPA/CE guidelines (EPA/CE, 1977) is suggested for determination of the volume of disposal site water necessary to dilute the discharge liquid phase to acceptable levels. Assuming a barge load of 1,500 c.y. and a worst case release of 13.2 ppb into the water column, approximately 452,700 c.y. of water would be required to dilute released PCB's down to acceptable EPA 24-hour average guidelines. In actuality, less would be required since a clamshell dredge would be used.

b. Sediment Quality.

The action of disposal would displace dredged sediment from the harbors to the dump site. This action would not significantly change the present character of the dump site sediment since the area has been used as a dump site for a number of years. The dredged sediment analyses may be compared with the sediment analysis of the Boston Foul Area (New England Aquarium, 1975) (Table 6). The sediment textures of the majority of the harbor and the Boston Foul Area sediments are described as silty clay with the exception of Station A at the President Roads area and Station D in the Chelsea River where silty sands are present. Comparison of contaminant levels indicate that disposal of the harbor sediments would introduce relatively higher levels of oil and grease, mercury, chromium, copper, vanadium and PCB's to the dump site sediments. Other constituents are only moderately higher or lower (nickel) than the Foul Area sediments.

Generally, metals are bound to organic oxides, sulfides, or are adsorbed to or part of the crystalline structure of sediment particles; hydrocarbons are bound to organic particulates and fine sediments. These are generally unavailable to organisms in these forms and, therefore, would not be of concern. Point discharge would mound the harbor sediments so that most of the contaminated sediments would be unavailable in an anoxic sediment environment and would so remain so as long as anoxic conditions are maintained. However, disturbance of the sediment could oxygenate the reduced sediment causing releases of some metals into the water column. PCB's are strongly bound to organic particulates and are mostly insoluble in water. Stirring the particulates could increase its concentration in the water column (Fulk et al., 1975).

Two factors may disturb mounded sediments over the long term, bottom currents and biological activity.

The sediments of the Boston Foul Area have been characterized as fine sediments which are indicative of areas of deposition and low bottom currents. Studies by Schlee and Butman (1974) indicate that, at the majority of sites where currents have been measured in Massachusetts Bay, bottom sediments are in equilibrium with the maximum observed current speed. Thus, it appears that average current velocities (Section IV) at the Foul Area are not great enough to cause significant movement of dredged material deposited there. Acoustic profiling by Tucholke (1972) indicates that tens of meters of fine materials have accumulated in Stellwagen Basin since the Pleistoncene Epoch. It is his opinion that this area acts as a natural sediment sink for fine grained particles. However, winter storm waves could exert enough energy at the bottom to resuspend unconsolidated sediments (New England Aquarium, 1975). Such resuspension would be local and sporadic and probably would be directed in a shoreward direction.

The mound would be recolonized by opportunistic benthic organisms soon after disposal. Rhoads and Young (1970) found that life activity of these organisms can rework and stir the sediments down to about 10 cm in depth. Such activity could cause minor releases of sediment contaiminants which would be quickly diluted by the bottom currents. Potentially available contaminants down to the 10 cm depth eventually would reach an equilibrium with the water column concentrations. Unless the mound is disturbed, the contaminants below this depth could remain sequestered indefinitely.

3. Impacts on Organisms

a. Physical Effects

i. Turbidity

The increased levels of suspended solids during disposal operations would be short term and localized. The impacts of disposal on phytoplankton were monitored at the Foul Area during disposal operations in 1973 (Martin and Yentsch, 1973). The authors found no evidence to suggest that the natural seasonal fluctuations of phytoplankton were disturbed. The effects of turbidity on benthic deposit feeders, filter feeders, and fish have been discussed in Section A.3. Again impacts would be mimimal and short term.

ii. Sedimentation

The disposal of dredged sediments would bury any benthic organisms at the dump site. Burrowing sediment feeding organisms, especially deep-burrowing forms, would have a better chance of survival than non-motile or less mobile forms living on the surface (Maurer et al. 1978). Burying of the more sensitve eggs, larvae and juvenile forms would probably result in death. Large motile forms such as fish or crabs would have a better chance of survival. Recolonization by smaller shortlived pioneering species would occur soon after disposal. Rhoads et al. (1978) and McCall (1977) have shown that successions of benthic communities would follow until a climax community of longer lived larger species become established. This would occur provided that the site will not be disposed on again within a few years. Once established, the tubes of many recolonized invertebrates may actually stablize the mound surface (Saila, personal communication). Complete recovery of the benthic productivity, if it occurs at all, would be difficult to predict but may range from 1.5 years (U.S. Navy, 1979) to 11 years as calculated by Saila (1973) provided subsequent dumping does not occur. This may not be true in this case since the Foul Area is a designated dump site.

b. Chemical Effects

The bioassay tests have been developed to measure the potential of toxicity of dredged material to representive organisms. Briefly, appropriate sensitive organisms are subjected to three phases of dredged material likely to cause impacts: the liquid phase which is release from the pore water of the sediments, the suspended solid phase which is related to fine sediments, and the solid phase which is concerned with the sediment deposition on the dump site sediments. Mortalities of the exposed organisms are statistically compared with organisms exposed to a similar but "not previously dumped on" reference sediment. The details of the test procedures are more fully described in EPA/CE (1977).

The uptake of sediment contaminants by organisms is also of concern. The bioaccumulation test was devised to determine the potential occurance of biological assimilation of sediment contaminants after disposal. The test involves a statistical comparison of the tissue contaminant levels of organisms exposed to the dredged sediment (usually survivors of the solid phase testing) with organism exposed to a control sediment. The test procedure is also fully described in EPA/CE (1977).

Energy Resources Company has conducted bioassay/bioaccumulation tests for the sediments to be dredged in this project. The sample sites of each dredging area are shown in Figures 1-6. Test reports on each area are available upon request.

Analysis of the test results of all three bioassay phases for all areas indicates that: (1) there was no statistical difference between the mortalites of the test and control organims, or (2) if there was a statistical difference in mortalities, a dilution analysis (Appendix H, EPA/CE 1977) showed that any toxic substances would be diluted to acceptable levels (0.01 of the concentration which causes 50% mortality) within four hours of disposal.

The bioaccumulation test indicates potential uptake of mercury at Station B in the Mystic River, Stations A, C and D in the Chelsea River and Stations A, B and C in the President Roads area. Positive accumulation was only shown in the filter-feeding hard shell clam, Mercenria mercenaria. The trace metal cadimum was also accumluated at Stations C and D in the Chelsea River by the marine worm Nereis virens. Petroleum hydrocarbons were accumulated by Mercenaria at all stations of each dredging area. No accumulation was indicated for PCB's or DDT.

Notwithstanding these results, it appears that the relative level of uptake is not of concern. Tissue mercury concentrations in Mercenaria ranged from 0.011 to 0.013 ppm. Such levels are well within the FDA action level of mercury contamination in fish and shellfish (1.0 ppm, FDA, 1978). Cadmium levels in the polychaete, Nereis, ranged from 0.088 ppm to 0.094 ppm at Stations C and D in the Chelsea River. FDA levels for cadmium have not been established for aquatic organisms. However, tissue concentrations at the other sites were within the same range (0.072 ppm to 0.094 ppm) and were not statistically significant. Further, Nereis exhibited "non-significant" accumulation of cadmium at other New England harbors within a broader range of tissue levels: 0.045 ppm to 0.106 ppm. Thus, the statistically significant tissue levels in Nereis at Chelsea Stations C and D are not of concern because the levels are within the range of non-statistically significant results.

The potential biological uptake of petroleum hydrocarbon ranged from 1.9 to 10.1 ppm in clams exposed to the President Roads sediments and 5.1-6.1 ppm in clams exposed to the Mystic and Chelsea River sediments. Although this accumulation was statistically significant, the relative tissue levels may not be of concern. Tissue levels for petroleum hydrocarbon have not been established by the FDA. However, the above tissue concentrations are comparable to baseline levels of most organisms 0.01 ppm to 10 ppm; whereas organisms exposed to petroleum pollution typically contain from 1 to 1,000 ppm (Clark and MacLeod, 1977). In addition, bioaccumlation tests of other New England harbors indicated that tissue levels for the same species ranged from 0.4 to 12.4 ppm with an average of 5.2 ppm and are not statistically significant. Accumulation levels for sediment of this project are within that range.

Studies on uptake of petroleum hydrocarbons indicate that accumulation from contaminated sediments is relatively minor when compared with uptake from water (Disalvo et al. 1977; Burns and Teal, 1973). The elutriate test (Tables 8, 9 and 10) indicated that the worst case release of the oil and grease fraction was minimal at best. Disalvo et al. (1977) found this to be true for dredged material in general. Thus, the potential uptake as exhibited by the bioaccumulation test would likely be minor. Mounding of the dredged sediments at the disposal site would isolate the majority of contaminants from the invading organisms or potential resuspension after the concentration at the surface sediments reach an equilibrium with the water column. Thus, the extent of the uptake is likiey to be minor and short term.

Another major concern is the potential for predators to carry contaminants outside of the disposal area via prey with contaminated tissue. For this to occur on a significant scale, the petroleum hydrocarbon would have to be transferred and magnified through the food chain. There is no evidence to date that this occurs in marine ecosytems for petroleum hydrocarbons. Recent studies by Burns and Teal (1973) suggest that there is no relationship between petroleum hydrocarbon concentration in tissue and an animals position in the food chain. Review of the literature by Conner et al. (1979) supports this theory. Therefore, the potential accumulation exhibited by *Mercenaria*, if it were to occur at all, would be localized at the dump site. The lack of utilization of the Boston Foul Area aquatic resources would further reduce the chances of, if any, impact to man.

C. Endangered Species

Disposal during the late spring, summer and early fall months would have a small or immeasurable impact on any endangered or threatened species which may to be at the disposal site during this time. Given the sparseness of the sitings in the affected area, the short time that disposal operations would actually take place, and the small size of the area involved, the potential for encounter is slight. As indicated above, only two whale sitings were made within a 75-square-nautical-mile area surrounding the disposal site during 1979. The actual time of disposal would involve a total of 20-30 minutes per 24-hour day. This assumes that 4-6 scows would take a maximum of 5 minutes apiece to discharge the dredged material. Disposal studies in Long Island Sound have shown that 99% of clamshell dredged material falls immediately to the sea floor (Gordon, 1974). The total area that would be affected is estimated to be within 250 yards of the dump site buoy, which is approximately 1/160 of 1% of the total area of Massachusetts Bay. Thus, the chance of encountering a species during operation in the affected area would be small.

If an animal is encountered in the disposal area, disposal operations and associated turbidity may physically disrupt the natural movements or feeding activities of the species which happens to be within a 250-yard radius of the disposal site buoy. However, the disruption would be short term and localized.

If an animal is encountered, it is more likely the animal would avoid the disposal activities. Whale movements are closely associated with food species by way of their sonar apparatus. It is probable that any schooling prey species would quickly avoid such activities and draw away their predators with them.

If by chance an endangered species is dumped on during disposal activities, the effects on that organism would be unknown. No studies have been concerned with the effects of suspended dredged material on whales or turtles. Nor are such studies likely to be conducted because of the endangered or threatened status of the animals.

There is some concern for impacts on the food species of the endangered species. Based on the number of sightings in the Stellwagen Bank area, the species mostly likely to be present in the vicinity of the disposal site would be the finback and humpback whales (URI, 1981). Both species feed primarily on the sand lance (Ammodytes americanus) which have marketly increased in numbers in the Bank area since 1975 (Meyer et al. 1979).

Impacts to the sand lance may be broken down in the three aspects of their life activities: (1) daily activities in terms of schooling and burrowing, (2) their food source, and (3) reproductive habitat.

Most of the daily activites of the sand lance involve either swimming in schools or burrowing in suitable substrate. Impacts to their natural schooling movements are likely to be short term and localized. As mentioned above, the short time that disposal would actually take place (20-30 minutes per day) and the small affected area involved (1/160 of 1% of Massachusetts Bay) would reduce the chances of encounter with a passing school. It is likely that the school would avoid the disturbance of the operations and not be affected because of the high mobility of this species.

The sand lance also spends a portion of its time burrowing in the sand. It has a marked perference for clean sand and fine gravel substrate associated with a bottom current of about 0.4 - 0.5 knots (c25 cm/sec) (NMFS, personal communication). The entire Boston Foul Area dump site sits in a basin (Figure 8), which is made up of primarily of silty clay (anthropogenic and naturally occurring) with associated currents which average 4-5 cm/sec. This area of sediment accumulation is not considered as potenial habitat for burrowing sand lance. The best habitat for such activity is on the Stellwagen Bank, east of the disposal site. Since the net movement of currents at the disposal site is in a shoreward direction and the 200 foot ridge east of the dump site isolates the site from the Bank area, it is unlikely that the dredged material will move on to the preferred burrowing habitat on the bank.

It is not expected that the sand lance would significantly accumulate sediment contaminants. Approximately 99% of the contaminant-laden sediments would settle to the bottom almost immediately. If any uptake by organisms in the vicinity were to occur, it would occur through the water column. The lack of mixing of the cohesive sediment masses with the water column and the dilution by the water column would reduce any released contaminants to acceptable EPA levels. Studies have shown that release of contaminants during disposal is a short term phenonomen and would return to backround levels soon after disposal (Wright, 1978). Due to the high mobility of schooling sand lance which might be in the vicinity of the area during or shortly after disposal and given the level of release expected, it is doubtful that the organism would be sufficiently exposed to the affected area long enough for any significant accumulation to occur. Since it is unlikely that the sand lance would burrow in the deposited sediment, accumlation from the sediments also would not be of conern.

The food of the sand lance is primarily made up of copepods and other plankton (Meyer et al., 1979). The liquid and suspended solid phase bioassay indicated no toxicity to the copepod, *Acartia clausi*, and therefore, should not be a problem.

Few studies on the reproductive habitat of sand lances have been done. However, NMFS (personal communication) has indicated that the usual spawning substrate is again clean sand or fine gravel in about 20 feet of water or less. The Boston Foul Area offers no potential for such habitat.

Therefore, it is concluded that little or no short term impacts and no long term impacts are expected on the sand lance population due to the proposed disposal activities.

4. Historic & Archaeological Resources

As the area to be dredged by this project has been subjected to previous maintenance dredging, and disposal will be within a previously used site (the Boston Foul Area), no effect upon significant historic or archaeological resources is expected.

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VII. Coordination

A. Public Involvement

The following Federal, state and local agencies and entities were coordinated or consulted during the development of this report.

National Marine Fisheries Service
U.S. Environmental Protection Agency
U.S. Fish & Wildlife Service
U.S. Geological Survey
U.S. Coast Guard
Massachusetts Office of Coastal Zone Management
Massachusetts Division of Marine Fisheries
Massachusetts Division of Water Pollution Control
Special Commission on Development of Boston Harbor
Boston Pilots

A formal public notice for the proposed action was released on 22 September 1981. Comments on the public notice involved concern for turbidity effects on anadromous fish that use Boston Harbor, toxicity and bioaccumulation of sediment contaminants by marine organisms and impacts on endangered and threatened whales and turtles that use nearby Stellwagon Bank. This Environmental Assessment (EA)/ Finding of No Significant Impact (FONSI) which addresses these issues was released to the general public in December 1981. A water quality certificate and consistency determination with the Coastal Zone Management (CZM) policy were granted on 17 November 1981 by the Commonwealth of Massachusetts. Review by the National Marine Fisheries Service (NMFS) resulted in a formal Section 7 Consultation under the Endangered Species Act to determine the impacts of disposal on the whales and their prey. As part of the consultation process, a Biological Assessment was prepared and submitted to the NMFS for review on 16 March 1983(see Appendix E). This assessment together with a Corps/NMFS cooperative monitoring program (see subsequent correspondence, Appendix E), led to an eventual issuance of a tentative biological opinion that the whales or their prey would not be significantly impacted by the proposed action (letter dated 6 October 1982). Later changes in the dredging methodology did not change that opinion. A response to the Fish and Wildlife Coordination Act comments in the NMFS 23 February 1982 letter is also included in Appendix E.

The discovery of a Boston Edison submarine cable and an abandoned Metropolitan District Commission water tunnel in the Chelsea Federal Channel deferred the dredging of a 400 ft. reach. Dredging of that reach which involves about 8,000 c.y. of silty sediments (Station C in Figure 4) has been proposed for July 1984 in the 7 February 1984 Public Notice (Appendix E). The impacts of this work are addressed in this EA/FONSI which has been updated to include the most recent correspondence (Appendix E). The Massachusetts CZM has determined that a consistency determination was not necessary for the 8,000 c.y. of material.

Compliance with Environmental Protection Statutes and Executive Orders

Statutes	Compliance
1. Archeological and Historic Preservation Act, as amended, 16 U.S.C. 469 *et seq.*	No cultural resources were identified as being impacted by the proposed action.
2. Clean Air Act, as amended, 42 U.S.C. 7401 *et seq.*	Submission of this report to the Regional Administrator of the Environmental Protection Agency (EPA) for review constitutes compliance with Act.
3. Clean Water Act (Federal Water Pollution Control Act), as amended, 33 U.S.C. 1251 *et seq.*	A water audit certificate under Section 401 of this Act has been granted by the State; no Section 404 disposal activities are associated with this action.
4. Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 *et seq.*	The State has reviewed our proposal and has concurred with our consistency determination.
5. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq.*	A Section 7 consultation was developed which resulted in the issuance of biological opinion by the National Marine Fisheries Services (NMFS) that the proposed action would not affect endangered species.
6. Estuary Protection Act, 16 U.S.C. 1221 *et seq.*	Review of this document by the Department of Interior constitutes compliance with this Act.
7. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 *et seq.*	Same as above.
8. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 *et seq.*	Review by the U.S. Fish and Wildlife Service and the NMFS constitues compliance of this action.
9. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4 *et seq.*	Review by the Department of the Interior constitutes compliance with this Act.
10. Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 *et seq.*	The EPA has concurred with the Corps determination that the material is acceptable for Ocean Disposal.
11. National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 *et seq.*	No cultural resources would be impacted by the proposed action.
12. National Environmental Policy Act of 1969, as amended, 42 U.S.C. 432 *et seq.*	The preparation, publication and public review of this document constitutes compliance with this Act.

Statutes	Compliance
13. Rivers and Harbors Appropriation Act of 1899, as amended, 33 U.S.C. 401 *et seq.*	Not Applicable.
14. Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 *et seq.*	Not Applicable.
15. Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 *et seq.*	Not Applicable.

Executive Orders	Compliance
1. Executive Order 11988, Floodplain Management, 24 May 1977.	Not Applicable.
2. Executive Order 11990, Protection of Wetlands, 24 May 1977.	Not Applicable.
3. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.	Not Applicable.

Response to 23 February 1982

National Marine Fisheries Service Comment Letter

<u>Pages 1-2, Endangered Species Act Review</u>.

A Biological Assessment (dated 16 March 1982) of the Impacts of Dredge Material Disposal on Endangered Species at the Foul Area, Massachusetts Bay has been prepared under Section 7 of the Endangered Species Act that incorporated the new information provided by the National Marine Fisheries Service (NMFS). Pertinent correspondence may be found in the Coordination Section of this report.

<u>Pages 3-4, Fish and Wildlife Coordination Act Review</u>.

Page 3, Paragraph 1: No response required.

Page 3, Paragraph 2, sentence 1. The following bioassay/bioaccumulation tests used in the comparisons mentioned are listed according to the contaminants accumulated.

PHC's in <u>Mercenaria</u> showing non-significance

- Neponset River for Massachusetts Dept. of Environmental Quality and Engineering (DEQE)	July	80
- Lynn Harbor for Corps of Engineers (CE)	Nov.	80
- Salem Harbor for CE	Nov.	80
- Stonington Harbor for CE	Jan.	81
- Taunton River/Mt. Hope Bay for CE	May	81
- Weymouth Fore River for CE	Jan.	81

Cd in <u>Nereis</u> showing non-significance

- Allerton Harbor for DEQE	Oct.	80
- Lynn Harbor for CE	Nov.	80
- Salem Harbor for CE	Nov.	80
- Stonington Harbor for CE	Jan.	81
- Weymouth Fore River for CE	Jan.	81
- Neponset River for DEQE	July	80
- Taunton River/Mt. Hope Bay for CE	May	81

Hg in Mercenaria showing non-significance

- Allerton Harbor for DEQE	Oct. 80
- Lynn Harbor for CE	Nov. 80
- Salem Harbor for CE	Nov. 80
- Stonington Harbor for CE	Jan. 81
- Taunton River/Mt. Hope Bay for CE	May 81
- Weymouth Fore River for CE	Jan. 81
- Mystic River for Schiavone & Sons	Sept. 80
- Neponset River for DEQE	July 80

Page 3, Remainder of Paragraph 2:

We partially agree in that applying FDA action levels to lower marine food chain organisms may not provide an accurate measure of possible impacts to man. Since heavy metals and petroleum hydrocarbons have not been shown to biomagnify (to any significant degree) through the food chain, any accumulation of these contaminants in lower level organisms should not be expected to pass on to higher level organisms. In that regard, to apply FDA action level limits to lower order species (those not normally consumed by man) for the constituents of concern in the Chelsea River testing, would be an overestimation of what levels could actually be reaching man. However, since this method of analysis represents a "worst cast" scenario, if it results in a decision that the sediment in question is judged acceptable for ocean disposal, then the method of analysis should apply to lower order food chain organisms as well, with the same decision applying.

Page 3, Paragraph 3:

For the case at hand, this is an unsupported contention. The bioassays were performed and evaluated according to specification detailed in the Corps/ EPA implementation manual (Green Book). EPA's evaluation of the results concludes that the material is acceptable for ocean disposal at the Foul Area. A significant portion of the sediment removed by the maintenance project has already been disposed at the designated site with no reports of any significant adverse impacts. Consequently, we believe there is no cause for concern regarding potential impacts from this material.

Page 3, Paragraph 4:

See previous comments regarding potential effects on man. Regarding the bioassay/bioaccumulation tests, the current procedures were developed by the Corps and EPA using state-of-the-art methodologies based on existing scientific information available. The procedures are currently being scrutinized for possible revision. Until new procedures are developed, the "Green Book" protocol will be used. We welcome any suggested changes NMFS may have to offer.

Depending on the final determination on any project sediment and the dumpsite to be used, the Corps incorporates many environmentally protective safeguard measures for managing its disposal. We do not believe that inner Boston Harbor sediments can be categorically classified as being more polluted than the outer harbor sediments. There are different contaminant sources applicable to both areas.

Page 4, Paragraph 1:

We agree that capping is still in the experimental stage and that depth of water at the disposal site could play an important role in its effectiveness. The feasibility of capping at the Foul Area is still being investigated. Indications to date show that it may not be considered as effective as other areas, particularly Long Island Sound. NMFS will be advised whenever a conclusion is reached. The 8,000 c.y. of material to be dredged from the Chelsea River Federal maintenance project has been determined to be in compliance with the Ocean Dumping criteria without necessitating it to be capped with other material. Therefore, while there will be certain requirements for its disposal (ie: point dumping at a buoy and supervision by a Corps inspector), there will be no specification regarding covering it with other material.

Page 4, Paragraph 2:

Monitoring disposal operations and their effects on living marine resources is a continuing part of NED's DAMOS program. Reports on the program are furnished to all interested agencies and individuals on request.

Appendix A

GULF OF MAINE TIDAL SYSTEM

STATISTICAL SUMMARY

Parameter	No. of Cases	Mean	Standard Deviation	Mean Plus One Stand. Deviation	Mean Plus Two Stand. Deviation
% Volatile Solids - EPA	553	5.593	5.322	10.915	16.237
% Volatile Solids - NED	393	4.372	4.992	9.364	14.356
% Tot. Vol. Solids - EPA	350	8.776	7.321	16.097	23.418
PPM Chem. Oxygen Dmnd	383	74,541	73,464	148,005	221,469
PPM Tot. Kjeldahl Nit.	382	2,163	2,231	4,394	6,625
PPM Oil & Grease	383	2,532	3,829	6,361	10,190
PPM Mercury	597	0.573	1.210	1.783	2.993
PPM Lead	598	83.2	100.8	184.0	284.8
PPM Zinc	598	134.5	151.0	285.5	436.5
PPM Arsenic	598	6.98	7.66	14.64	22.3
PPM Cadmium	597	3.12	6.25	9.37	15.6
PPM Chromium	597	112.0	225.4	337.4	562.8
PPM Copper	591	83.2	129.4	212.6	342.0
PPM Nickel	598	36.3	27.7	64.0	91.7
PPM Vanadium	598	60.9	58.9	119.8	178.7
% Total Carbon	165	3.342	2.172	5.514	7.686
% Hydrogen	165	0.692	0.456	1.148	1.604
% Nitrogen	165	0.388	0.363	0.751	1.114
PPB DDT	55	33.67	66.83	100.50	167.33
PPB PCB's	55	613.57	1033.3	1646.87	2680.17

Appendix B

Boston Inner Harbor Species List

Scientific Name	Common Name
ARTHROPODA (Shrimp, Scuds, Crabs, and Lobsters)	
Carcinus maenas	Green Crab
Cancer irroratus	Rock Crab
Corophium sp.	Scud
Crangon septemspinosus	Sand Shrimp
Gammarus duebeni	Scud
Microdeutopus anomalus	Scud
Pandalus borealis	Pandalid Shrimp

Source: Stewart (1968)
Boston Edison (1972)
Marine Environmental Services (August 1976)
Marine Environmental Services (November 1976)
Boston Edison (December 1976 - May 1977)

Appendix B

Boston Inner Harbor Species List

Scientific Name	Common Name
CNIDARIA (Hycdroids, Anemones, Jellyfish)	
Aurelia aurita	
Hydrozoa (unidentified)	
Metridium senile	
ANNELIDA (Segmented and Polychaete worms)	
Capitella capitata	
Capitella gracilis	
Cistenides gouldii	
Eteone longa	
Eteone sp.	
Harmothoe imbricata	
Harmothoe sp.	
Microthamus abberaus	
Nepthys incisa	Shimmy worm
Nereis diversicolor	
Nereis sp.	
Nereis succinea	
Nereis virens	Clam worm
Ophelia sp.	
Pharyx acutus	
Phloe minuta	
Phyllodoce groenlandica	
Phyllodoce maculata	
Phyllodoce mucosa	
Polydora ciliata	
Polydora hamata	
Polydora ligni	
Polydora sp.	
Polydora websteri	
Scolelepis squamata	
MOLLUSCA (Clams and Snails)	
Crepidula fornicata	Slipper limpet
Crepidula plana	Slipper limpet
Mya arenaria	Soft-shelled clam
Mytilus edulis	Blue mussel
Nassarius obsoletus	
Tellina sp.	Tellin or Sunset shell

Appendix C

Boston Outer Harbor Species List

Scientific Name	Common Name
CNIDARIA (Hydroids, Anemones, Jelly fish)	
Abietinaria abietina	
Bougainvillia (superciliaris)	
Cerianthus borealis	
Edwardsia leganse	
Thuiaria (similis)	
RYNCHOCOELA (Nemertean worms)	
Amphiporus sp. B	
Cerabratulus sp.	
Tubulanus sp.	
ANNELIDA (Segmented or Polychoete Worms)	
Ampharete acutiferons	
Ampharete acutiferons (juvenile)	
Amphitrite cirrata	
Cariidea jeffreysii	
Capitella capitata	
Cirratulid sp.	
Eteone longa	
Eteone sp.	
Euchone rubrocincta	
Harmothoe imbricata	
Heteromastus filiformis	
Lumbrinereis fragilis	
Microphthalmus aberrans	
Myriochele (heerei)	
Nepthys incisa	Shimmy Worm
Nepthys longesetosa	
Nepthys picta	
Ninoe nigrippes	
Paronis gracilis	
Pectinaria gouldii	Ice Cream Cone Worm or Trumpet Worm
Pherusa plumosa	
Phloe minuta	
Phyllodoce arenae	
Phyllodoce mucosa	
Polydora caeca	
Polydora sp. A	

Appendix C

Boston Outer Harbor Species List

Scientific Name	Common Name
ANNELIDA (Continued)	
Prionospio malmegreni	
Scalibregma inflatum	
Scoloplos acutus	
Spio filicornis	
Spiophanes (bombyx) A	
Stauroneis caeca	
Trochochaeta multisetosa	
MOLLUSCA (Snails and Clams)	
Cerastoderma pinnulatum	
Hiatella arctica	
Tellina agilis	Tellin or Sunset Shell
ARTHROPODA (Shrimps, Scuds, Crabs, and Lobsters)	
Calanus finmarchius	
Centropages sp.	
Crangon septemspinosus	Sand shrimp
Diastylis quadrispinosa	
Diastylis sculpta	
Diastylis sp.	
Edotea acutus	
Eurystheus sp.	
Halcarus sp.	
Haploops setosa	
Leptocheirus pinguis	
Leucothoe spinicarpa	
Loxoconcha guttata	
Macrosetella sp.	
Micropterus sp.	
Nymphon grossipes	
Orchomonella groenlandia	
Photis macrocoxa	
Pleusymtes glaber	
Stenopleustes inermis	
Unicola irrorata	
ECHINODERMATA (Starfish, brittle stars; sea urchins and sea cucumbers)	

Source: Stewart (1968)
New England Aquarium (1972)

Appendix D

Boston Inner and Outer Harbors Finfish Species List

Scientific Name	Common Name
Alosa pseudoharengus	Alewife
Anguilla rostrata	American eel
Ammodytes americanus	American sandlance
Osmerus mordax	American smelt
Gadus morhua	Atlantic cod
Clupea harengus harengus	Atlantic herring
Scomber scombrus	Atlantic mackerel
Brevoortia tyrannus	Atlantic menhaden
Menidia menidia	Atlantic silverside
Microgadus tomcod	Atlantic tomcod
Lepomis macrochirus	Bluegill
Pomatomus saltatrix	Bluefish
Alosa aestivalis	Blueback herring
Peprilus triacanthus	Butterfish
Cyprinus carpio	Carp
Tautoglabrus adspersus	Cunner
Brosme brosme	Cusk
Apeltes quadracus	Fourspine stickleback
Myoxocephalus aenus	Grubby
Urophycis sp.	Hake
Raja erinacea	Little skate
Myoxocephalus octodecemspinosus	Longhorn sculpin
Cyclopterus lumpus	Lumpfish
Fundulus heteroclitus	Mummichog
Pungitius pungitius	Ninespine stickleback
Syngnathus fuscus	Northern pipefish
Macrozoarces americanus	Ocean pout
Pollachius virens	Pollock
Osmerus mordax	Rainbow smelt
Esox americanus americanus	Red fin pickerel
Urophycis chuss	Red hake
Liparis atlanticus	Sea snail
Hemiptripterus americanus	Sea raven
Prionotus sp.	Sea robin
Myoxocephalus sp.	Sculpin

Appendix D

Boston Inner and Outer Harbors Finfish Species List

Scientific Name	Common Name
Merluccius bilinearis	Silver hake
Liopsetta putnami	Smooth flounder
Squalus acanthias	Spiny dogfish
Anchoa hepsetus	Striped anchovy
Morone saxatilis	Striped bass
Fundulus magalis	Striped Killifish
Gasterosteus aculeatus	Threespine stickleback
Cynoscion regalis	Weakfish
Scophthalmus aquosus	Windowpane
Morone americanus	White perch
Merluccius merluccius	Whiting
Pseudopleuronectes americanus	Winter flounder
Raja ocellata	Winter skate
Limanda ferruginea	Yellowtail flounder

Appendix E

Pertinent Correspondence

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
P.O. Box 1518
Concord, New Hampshire 03301

Ref: NEDOD-N

OCT 2 1 1981

Colonel William E. Hodgson, Jr.
Deputy Division Engineer
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Colonel Hodgson:

We have reviewed the Public Notice dated September 22, 1981, and the material accompanying Mr. Andreliunas' letter of August 14, 1981, concerning the proposed maintenance dredging of the Mystic and Chelsea Rivers and President Roads Anchorage, Boston Harbor, Massachusetts. The proposed work involves maintenance dredging of 425,000 cubic yards of material with ocean disposal at the Foul Area in Massachusetts Bay.

The proposed dredged material has undergone bioassay/bioaccumulation testing according to the Ocean Dumping Criteria. The results of the bioaccumulation tests indicate that hard clams (Mercenaria mercenaria) exposed to the sediments of President Roads and the Mystic and Chelsea Rivers bioaccumulate mercury and petroleum hydrocarbons, and sandworms (Nereis virens) exposed to Chelsea River sediments bioaccumulate cadmium. This potential for bioaccumulation of these constituents is cause for concern. Your staff takes the position that the levels accumulated are low and less than the levels established by the New York District, Corps of Engineers, in their draft interim guidance matrix (U.S. Army, Corps of Engineers, 1981). However, the levels established by the New York District for the Mud Dump Site do not necessarily apply to other disposal areas. We have recommended in the past and continue to recommend that you investigate the levels of contaminants in and around Massachusetts Bay, if a guidance matrix approach is to be used. In the absence of such information, we consider the results of the bioaccumulation test to indicate that the proposed dredged material could cause adverse impacts to the marine resources of Massachusetts Bay.

The public notice does not address alternative disposal methods that were considered. We assume that the Environmental Assessment will address this issue, and we reserve our comments on this issue until we review this document.

We have previously discussed the need for the management of dredged spoil disposal in New England. It appears that now is an appropriate time to establish an Interagency Steering Committee to review the management of dredged material disposal in New England. The management plan should address issues such as:

alternatives to ocean disposal, evaluation of bioassay/bioaccumulation test results, and special handling of potentially harmful dredged materials at the disposal sites.

In summary, we consider that the proposed dredged material does not comply with the ocean dumping criteria and, therefore, we recommend against the ocean disposal operations as described in the public notice. We strongly recommend that an interagency meeting be held to discuss the special handling of the Boston Harbor dredged material and to establish the framework for an Interagency Steering Committee on the long range management of dredged material in New England.

We will provide additional comments after review of the Environmental Assessment and as additional information becomes available. Please keep us informed of any changes in project plans.

Sincerely yours,

Gordon E. Beckett

Gordon E. Beckett
Supervisor

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

November 4, 1981

V.L. Andreliunas
Chief, Operations Division
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, MA 02254

Re: NEDOD-N Maintenance Dredging of Mystic and Chelsea Rivers and President Roads Anchorage, Boston Harbor, Massachusetts

Dear Mr. Andreliunas:

We have reviewed the Public Notice dated September 22, 1981 concerning the Boston Harbor Maintenance dredging project, along with the bioassay/bioaccumulation test results and bulk sediment analyses. We concur with your analysis (Disposition Form dated September 23, 1981) and conclusion that this material is acceptable for ocean disposal at the "Foul Area" in Massachusetts Bay. Certain time of year restrictions on dredging may be necessary in order to protect resident fish and shellfish from adverse effects related to turbidity and sedimentation. The Corps should coordinate this aspect with the State of Massachusetts and the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

We concur with your proposal to dredge the most contaminated sediments first, (inner harbor areas, Mystic and Chelsea Rivers) to be followed by the outer harbor dredging at President Roads. Sequential dredging should incorporate to the extent possible private dredging projects such as Gulf Oil Company, Boston Edison and Pittston Petroleum, all in Chelsea River.

A taut line buoy may be necessary at the "Foul Area" in order to achieve the precision dumping required to have any containment of the more contaminated sediments by covering with cleaner sediments. We feel a monitoring plan should be implemented for the "Foul Area" to determine what covering is taking place.

We believe it is appropriate to arrange for the involved Federal and State agencies to review the management of dredged material disposal in the Boston Harbor vicinity. The review should address issues such as alternatives to ocean disposal, evaluation of bioassay/bioaccumulation test results, and special handling of potentially harmful dredged materials at the disposal sites. Together as a group, we may be able to come to an agreement on dredged material disposal practices and monitoring needs and plans at the dumpsite.

We look forward to further coordination in this regard. Feel free to contact Edward Reiner of my staff at 223-5061 concerning these matters.

Sincerely yours,

Allen J. Ikalainen

Allen J. Ikalainen
Chief, Special Permits Section

cc: USFWS, Concord, NH
National Marine Fisheries Service, Gloucester, MA
Fran Donovan, Navigation Branch, USCOE
MA CZM, Harriet Diamond
MEPA, EOEA, Dave Shepardson
DEQE, Division of Water Pollution Control, Rich Tomczyk

COASTAL ZONE MANAGEMENT

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

November 6, 1981

Colonel C.E. Edgar III
Corps of Engineers
424 Trapelo Road
Waltham, MA 02154

Dear Colonel Edgar:

We have reviewed the information for the maintenance dredging project in the Mystic and Chelsea Rivers, and the President Roads Anchorage in Boston Harbor, Massachusetts. A total of 425,000 cubic yards of material will be excavated from those areas and disposed of at the Marblehead Foul Area. This project is scheduled to occur during the period from Spring to Fall, 1982.

Results of chemical and biological tests indicate elevated contaminant levels in the dredge sediments and potential for bioaccumulation of the contaminates in marine biota. However, we recognize the lack of alternatives to ocean dumping for this large volume of dredge sediments. In addition, it is a policy of Massachusetts Coastal Zone Management to promote the enhancement of water dependent uses in Designated Ports such as Boston Harbor. In this instance, dredging the harbor is necessary to insure both the maintenance and development of commerce in the tributaries of Massachusetts Bay. For this reason we concur with your consistency statement. However, we support the request by the Massachusetts Division of Marine Fisheries that dredging not be conducted in the Mystic River during the period that alewife runs occur (April 15 - June 15). The Division has also requested that the Corps notify lobster fishermen in Boston Harbor of the dredging schedule so that they may have sufficient time to relocate their gear. The Division has offered to provide a list of fishermen actively fishing Boston Harbor.

We look forward to assisting the Corps with both maintenance and improvement dredging in Boston Harbor. For future correspondence on these projects please contact Harriet Diamond of my staff.

Sincerely,

Richard F. Delaney

Director

RFD:HD:sla

ANTHONY D. CORTESE, Sc. D.
Commissioner

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Water Pollution Control
ONE Winter Street, Boston 02108

November 17, 1981

V.L. Andreliunas
Chief, Operations Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Re: Water Quality Certification
Maintenance Dredging
Mystic River, Chelsea River
President Roads Anchorage
Boston

Dear Mr. Andreliunas:

In response to your request in your letter dated August 18, 1981, this Division has reviewed your application for a water quality certification for maintenance dredging in portions of Boston Harbor with disposal at the Marblehead Ocean disposal site. The work, which is scheduled to start in the spring of 1982, involves the removal of 425,000 cubic yards of fine grained material from the following areas: Mystic River (100,000 c.y.), Chelsea River (25,000 c.y.) and President Roads Anchorage (300,000 c.y.). All material will be excavated by a clamshell dredge and transported by scow to the disposal area.

In accordance with the provisions of Section 401 of the Federal Water Pollution Control Act as amended (Public Law 95-217), this Division hereby issues the following Water Quality Certification relative to this project, subject to the following conditions:

1. The dredging portion of the project could result in a violation of water quality standards adopted by this Division. Therefore, reasonable care and diligence shall be taken by the contractor to assure that the proposed activity will be conducted in a manner which will minimize violations of said standards.

2. Disposal of the dredged material into waters of the Commonwealth is prohibited. The Permits Section of the Division of Water Pollution Control (292-5666, 5668) must be notified by phone and in writing should any disposal occur in the waters of the Commonwealth. This notification will include the date, location, source of material and quantity of material that was improperly disposed.

Should any violation of the water quality standards or the terms of this certification occur as a result of the proposed activity, the Division will direct that the condition be corrected. Non-compliance on the part of the permittee will be cause for this Division to recommend the revocation of the permit(s) issued therefor or to take such other action as is authorized by the General Laws of the Commonwealth. This certification does not relieve the applicant of the duty to comply with any other statutes or regulations.

Very truly yours,

Thomas C. McMahon

Thomas C. McMahon
Director

TCM/RT/wp

cc: Anthony D. Cortese, Sc.D., Commissioner, Department of Environmental Quality Engineering, One Winter Street, Boston 02108
Morgan Rees, Chief, Permits Branch, Corps of Engineers, 424 Trapelo Road, Waltham 02154
John J. Hannon, Director, Division of Land & Water Use, Department of Environmental Quality Engineering, One Winter Street, Boston 02108
Richard Cronin, Director, Division of Fisheries & Wildlife, 100 Cambridge Street, Boston 02202
Philip Coates, Director, Division of Marine Fisheries, 100 Cambridge Street, Boston 02202
Michael Penney, Coastal Zone Management, 100 Cambridge Street, Boston 02202

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

COASTAL ZONE
MANAGEMENT

November 17, 1981

Colonel C.E. Edgar III
Corps of Engineers
424 Trapelo Road
Waltham, MA 02154

Dear Colonel Edgar:

This letter is in explanation of the time restriction for dredging the Mystic River in Boston, Massachusetts which was included in our consistency determination for the Corps' Boston Harbor project. The Corps has requested an explanation of this restriction and has asked for a reference list of studies which have demonstrated the impacts of high turbidity levels on fish.

According to the Massachusetts Division of Marine Fisheries, restrictions on the timing of dredging activities in anadramous/catadramous fish runs should be imposed for periods during the migration of fish up or downstream. This is due to the lethal and sublethal effects of turbidity from suspended sediments on fish species. These effects include deleterious changes in respiration, interference with gill functions, abrasion of gill and other tissues, increased mucous and hematocrit production, increased carbohydrate utilization, reduced activity, and reduced growth rate. These responses have not been observed in all species examined and are a factor of physical parameters such as water temperature and suspended particulate concentration. As an introductory reference to this problem, we refer you to the Corps' Dredged Material Research Program Technical Report D-78-21, dated June 1978 and titled "Effects of Turbidity and Suspended Material in Aquatic Environments."

During its initial review of this project, the Division of Marine Fisheries considered the potential for these effects to occur in alewives if dredging continued in the Mystic River during the upstream migration of this species. However, as the majority of dredging in that river is planned for areas along the banks of the Mystic and not the entire channel, the Division and MCZM now agree that the alewives will still have adequate area for passage through remaining portions of the river which have lower turbidity levels. As a result of this reconsideration, we do not require a time restriction for dredging the Mystic River.

If we can be of any assistance with the Boston Harbor dredging project, please do not hesitate to call.

Sincerely,

Richard F. Delaney

Richard F. Delaney
Director

RFD:sla

cc: Leigh Bridges, DEQE-Division of Marine Fisheries
Richard Tomczyk, DEQE Division of Water Pollution Control
Edward Reiner - U.S. Environmental Protection Agency
Chris Manzaris - U.S. National Marine Fisheries Service
Bob Needemeyer - U.S. Fish and Wildlife Service

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Services Division
Habitat Protection Branch
7 Pleasant Street
Gloucester, MA 01930

February 23, 1982

Mr. V.L. Andreliunas
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, MA 02254

Dear Mr. Andreliunas:

This is in reference to your letter of December 21, 1981, and the previous public notice dated September 22, 1981, concerning maintenance dredging of Boston Harbor, including the Mystic River, Chelsea River and the President Roads Anchorage. The proposed work involves maintenance dredging of approximately 750,000 cubic yards of material to be disposed of at the Foul Area in Massachusetts Bay. We have reviewed the information enclosed with your letter and have provided our comments pursuant to the requirements of both the Endangered Species Act of 1973, as amended (ESA) and the Fish and Wildlife Coordination Act of 1958, as amended (FWCA).

Endangered Species Act Review

We have reviewed the Environmental Assessment and Finding of No Significant Impact forwarded to us in your letter of December 21, 1981, with regard to the requirements of Section 7 of the ESA. Your letter, supported by the Public Notice dated September 22, 1981, and the Environmental Assessment; states that:

1. disposal during late spring, summer and early fall will have a small or immeasurable impact on endangered or threatened species found in the area at that time;

2. sightings of protected species within a 75-square-mile of the Boston Foul Area (42° 20'N to 42° 30'N and 70° 30'W to 70° 40'W) taken from the 1979 Annual Report of the Cetacean and Turtle Assessment Program (CETAP) are sparse;

3. the actual disposal operation will disturb the upper water column for a small amount of time.

The letter concludes that the disposal activities would not affect or jeopardize the continued existence of endangered populations or their food species, and that further consultation with the National Marine Fisheries Service (NMFS) under Section 7 of the ESA is not necessary.

We cannot agree with your conclusion of "no effect" at present. The apparent sparseness of CETAP sighting data within a 75-square-mile area around the Foul Area is offset by significantly higher density estimates of fin and humpback whales in CETAP survey Block A, in which the Foul Area is located (Figure 1). Furthermore, recent data from studies partially funded by the NMFS Northeast Fisheries Center (NEFC) have become available. The Cetacean Research Unit, in cooperation with the Gloucester Fishermen's Museum, has compiled data from whale watching cruises operated twice daily (weather permitting) during the summer of 1981 in the general area of the Foul Area (usually to the north and east of the "A" buoy that marks the dump site). The final report to the NEFC will be available later this year.

Mason Weinrich, Principal Investigator for the Cetacean Research Unit grant, has provided us with a computer printout of his 1981 sighting data (enclosed). A plot of the sightings from these data shows 201 sightings of 52 individually identified humpback whales within the 75-square-mile area around the Foul Area from May 2 to September 27, 1981. This research effort recorded data on humpback whales only. Significant numbers of fin whales were also sighted but the data were not entered in the computer. The final report will analyze humpback whale behavior observed, and in many cases videotaped, during the 1981 season. The report will discuss movement patterns and/or site tenacity shown by the whales in the northern Stellwagen Bank area. Mr. Weinrich may be reached by calling (607) 257-7072. Similar research has been conducted on southern Stellwagen Bank during the same period by Charles Mayo, at the Provincetown Center for Coastal Studies, 59 Commercial Street, Box 826, Provincetown, MA 02657 (Telephone (617) 487-3622).

We believe that the existing data reveal that the proposed disposal operations may affect the humpback and fin whales found in the area during late spring, summer, and early fall. Therefore, we recommend that the Corps of Engineers initiate a formal Section 7 consultation on the project and incorporate this new information into their Environmental Assessment for resubmission as a Biological Assessment.

It is our opinion, upon reviewing the latest available information, that Stellwagen Bank is part of a preferred area for humpback and fin whales in the summer. These whales use this area for extensive feeding, resting, and nursing of calves from late May to early October. Therefore, we believe that potential federal actions that may affect this area should undergo the close scrutiny of a formal Section 7 consultation to assure that the animals will not be displaced or dispersed from this area. We intend to contact the Environmental Protection Agency regarding initiating a review of their designation of the Foul Area as an ocean disposal site. We believe that the long-term effects of using this area as an ocean disposal site on the whales found on Stellwagen Bank should be more closely studied. Ongoing and future studies on experimental ocean disposal management techniques also should be reviewed to evaluate the effectiveness of these techniques for protecting the whales and their environment.

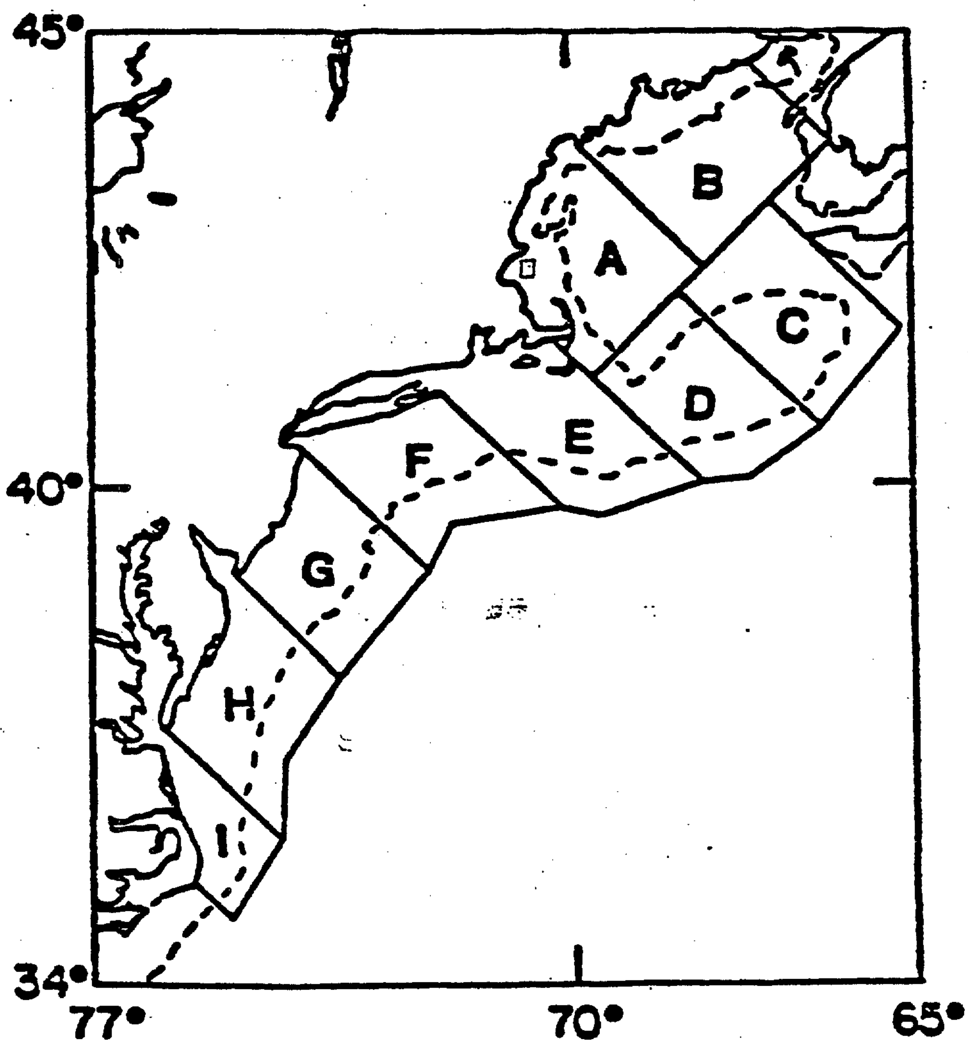

Figure 1. The CeTAP study area from Cape Hatteras, North Carolina, to Nova Scotia, Canada, and between the coastline to the surface projection of the 2,000 m depth contour. For sampling purposes, the study area was divided into nine sampling areas or blocks depicted by letters A through I.

Fish and Wildlife Coordination Act Review

The results of the bioassay/bioaccumulation test indicated that there is a potential for uptake of cadmium, mercury, and petroleum hydrocarbons by the grass shrimp (Palaemonetes pugio), hard clam (Mercenaria mercenaria) and sandworm (Nereis virens). The analysis provided by your staff indicates that the observed contaminant levels are of no concern because they are below current applicable Food and Drug Administration (FDA) action levels. Your staff's analysis further states that when the observed contaminant levels are compared with other bioassays conducted throughout New England, the values appear to be within limits considered "normal."

To enable the NMFS to evaluate this analysis, those other bioassays used in the comparisons should be referenced. Further, the NMFS considers it inappropriate to use FDA action levels as a means of determining the potential impacts to living marine resources. Applying FDA action levels to lower marine food chain organisms does not provide an accurate measure of possible impacts to man. It is true that current levels of contaminants in organisms at these sites may not affect humans; however, because contaminants may undergo biomagnification through the food chain, people who eat organisms from the higher trophic levels may be affected. For instance, Nereis is an important organism in the marine food chain that is regularly consumed by summer flounder, winter flounder, and many other species of fish frequently harvested by man. Predators such as summer flounder consume the entire worm and attached sediments. Contaminants adhering to those sediments then become part of the fish's tissue.

In previous letters, we noted that continued ocean dumping of polluted dredged materials may cause some long-term, chronic impacts on important marine fish. Contaminants could, for instance, affect phytoplankton production, fish and invertebrate spawning, and disease resistance of organisms in the area. Therefore, we believe that there is sufficient cause for concern for the potential impacts to marine resources.

We are concerned about the extensive ocean disposal of polluted dredged materials in this area. The large volume of polluted material to be dumped contains potentially toxic concentrations of mercury, cadmium and petroleum hydrocarbons. These chemicals have the potential to adversely affect living marine resources and, ultimately man. Further, we are concerned that the bioassay/bioaccumulation tests, as conducted, are poor indicators of long-term or cumulative effects on biological functions. Because alternatives other than creating a diked disposal area do not appear to be available, and because the material from the inner harbor area is more polluted than the outer harbor materials, we believe that a plan should be developed for managing ocean-disposed dredged material.

We understand from conversations with members of your staff that your office and the EPA are working on a management plan for disposal of dredged materials. The plan, as we understand it, is to cap the more polluted spoils with less polluted material. We realize this practice is being used in Long Island Sound and in the New York District; however, the conditions at the Foul Area are considerably different than those at the Long Island and New York disposal grounds. The depth at which material is being capped in those areas is 70 feet, compared with 300 feet at the Foul Area. Further, capping to contain polluted spoil is still in the experimental stage and has not been fully accepted by the scientific community. The ultimate stability of caps has yet to be proven. Although these concerns should not exclude the option of capping, they raise questions that need to be investigated:

1. Can capping material be accurately placed in 300 feet of water?

2. What percentage of capping material would actually cover the toxic sediments?

3. What is the potential for erosion of the capping material at this site?

Until proven a feasible alternative, capping operations at the Foul Area site should be considered an experimental disposal management method. We recommend that a field study with clean dredged material be performed to address the above questions. If proper evaluation indicates that capping is a viable disposal management method, then suitable capping material should be identified prior to conducting any disposal activity. In addition, the dump site should be closely monitored for negative impacts to living marine resources from any disposal operation.

We believe that it would be desirable to arrange, as soon as possible, a coordination meeting on dredged material disposal in the Boston Harbor vicinity. Please contact me at your earliest convenience at the above address or FTS 837-9247.

Sincerely,

Ruth Rehfus

Ruth Rehfus
Branch Chief

Enclosure

Biological Assessment of the Impacts of Dredged Material Disposal on Endangered Species at the Foul Area, Massachusetts Bay

U.S. Army Corps of Engineers
New England Division
Waltham, MA

16 March 1982

I. INTRODUCTION

This biological assessment was prepared in accordance with Section 7 of the Endangered Species Act of 1973. It discusses the environmental impacts of dredged material disposal operations at the "Foul Area" Ocean Disposal site on two endangered whales and a prey species. The information contained in this document is partially addressed in the Environmental Assessment for maintenance dredging of Boston Harbor, Boston, Massachusetts which was released in December 1981.

II. PROJECT DESCRIPTION

Maintenance dredging is proposed in the Mystic and Chelsea Rivers and in the President Roads Anchorage. The Federally authorized dimensions for these projects are: Mystic River Channel - 35 feet deep with widths varying from 400 feet to 1,000 feet, extending approximately one mile from the confluence of the Mystic and Chelsea Rivers to a point just downstream of the Alford Street Bridge; Chelsea River Channel - 35 feet deep with widths varying from 225 feet to 250 feet, extending approximately 1-1/2 miles upstream from the confluence to the Mystic and Chelsea Rivers; and President Roads Anchorage in the outer harbor - 40 feet deep for an area approximately 2,000 feet by 5,500 feet.

Maintenance dredging within the limits of these Federal projects would entail the removal of approximately 720,000 cubic yards of sediment (based on a 1981 survey) by a clamshell dredge which would place the sediment in scows that would be towed to the Foul Area Ocean Disposal site in outer Massachusetts Bay and point dumped at a buoy. The work would start in the summer of 1982 and continue through the fall. The contractor would be permitted to work 24 hours per day, but actual work shifts would depend on the capability of the approved low bidder. The typical contractor would work two, ten-hour shifts.

Work will begin in the Mystic River to be followed by the Chelsea River work and finally the President Roads Anchorage. Based on production rates set in the contract specifications, the Mystic work will take approximately 2 months to complete starting in July. Dredging in the Chelsea River will take about one month to complete and the President Roads work is expected to take approximately 3 months. During July and August when the Mystic River is being dredged, approximately 2 scows per day will be discharged at the disposal area. The Chelsea work would occur during September when approximately one scow per day will be discharged. During the fall when the President Roads Anchorage is being dredged, production will increase to approximately 3-4 scows per day over a 3 month period. Weather will be more of a factor at this time of year when as much as 20-25 percent of the days, no scows may be towed to the disposal area.

In addition to the Federal work, a number of private and municipal dredging and disposal projects in the Boston Harbor area are being contemplated. The disposal of these sediments at the Foul Area will be controlled and monitored and as necessary scheduled in accordance with the Federal work.

III. ENVIRONMENTAL SETTING

A. Existing Habitat

1. General

The Foul Area is approximately two miles in diameter and is located in Massachusetts Bay 22 nautical miles east of Boston with its center at latitude 42°25'N, longitude 70°35'W (Figure 1).

Physiographically, the site lies within the Stellwagen Basin, an elongated depression over 20 miles in length which trends northwest-southeast (Figure 1). The depression, at its deepest point, is 300 feet deep and is separated from the Stellwagen Bank area on the east by a 200-foot high slope.

The site is designated as an interim ocean disposal site and has been used for the disposal of dredged materials and industrial wastes.

2. Currents

The ocean currents in Massachusetts Bay and the Foul Area may be discussed in terms of tidal and nontidal components.

Daily tidal variations in Massachusetts Bay generally fluctuate about 3 vertical meters with spring tides approximately 0.5 m higher (Bumpus, 1974). Flood tides are in a westward direction whereas ebb tides are northeastward or eastward. New England Aquarium's (NEA 1975) study of Foul Area currents indicated mean tidal velocities of about 4-5 cm/sec near the bottom. Maximum velocities of 15-17 cm/sec were measured. Bumpus (1974) indicated higher maximum velocities ranging from 26-29 cm/sec for an area in Stellwagen Basin unknown to this author.

In comparison, the velocities of currents on the Stellwagen Bank areas are higher and range from 32-47 cm/sec.

The combined nontidal components of the Foul Area's bottom currents can be represented by the filtered current data measured by the NEA (1975). Current directions were quite variable but certain trends were identifiable for each season. Flows averaged in a southeast direction during winter, in a south or west direction during spring, in a westward direction during summer and in a northern direction during fall. However, the overall net drift in this area is shoreward (Bumpus, 1974). Nontidal current velocities ranged from 0-5 cm/sec with some episodic increases exceeding 5 cm/sec.

This current picture may be modified by surface storm activity especially during winter in Massachusetts Bay. Butman (1975) found that bottom currents in Massachusetts Bay move in the same direction of the wind in shallow areas and the opposite direction in deep areas. Bottom currents as high as 10 cm/sec may set-up in a particular direction. The longevity of a storm induced current is dependent upon how long a storm system, i.e., particular wind direction, remains in Massachusetts Bay. Adjustments of the bottom currents to the wind usually takes about 12 hours.

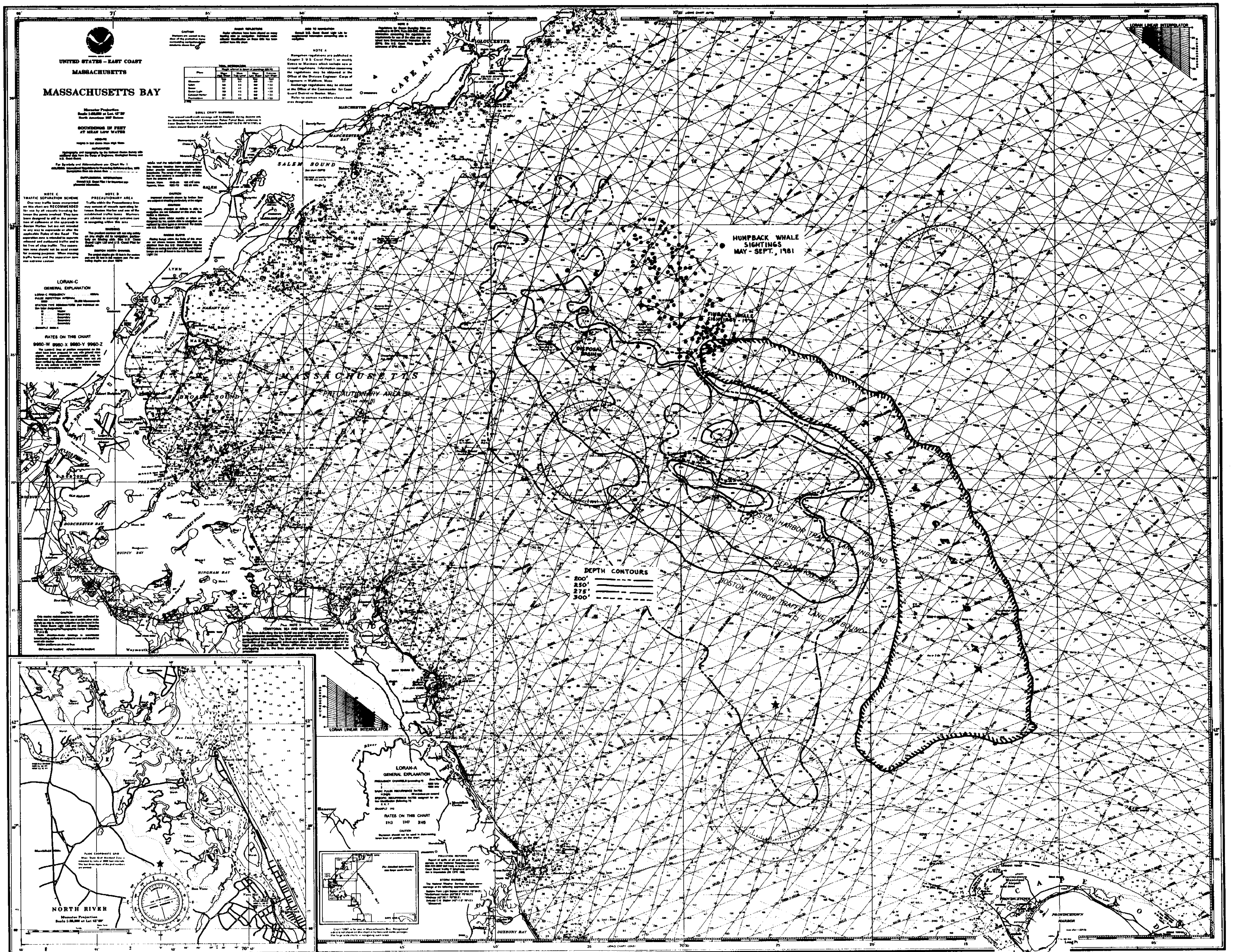
UNITED STATES—EAST COAST
MASSACHUSETTS
MASSACHUSETTS BAY
CAPE ANN
GLOUCESTER
MANCHESTER
SALEM SOUND
SALEM
LYNN
LORAN-C
GENERAL EXPLANATION
RATES ON THIS CHART
BROAD SOUND
MASSACHUSETTS
PRECAUTIONARY AREA
BAY
DORCHESTER BAY
QUINCY BAY
HINGHAM BAY
HUMPBACK WHALE
SIGHTINGS
MAY - SEPT., 1981
DEPTH CONTOURS
200'
250'
275'
300'
BOSTON HARBOR TRAFFIC LANE INBOUND
SEPARATION ZONE
BOSTON HARBOR TRAFFIC LANE OUTBOUND
LORAN LINEAR INTERPOLATOR
LORAN-A
GENERAL EXPLANATION
NORTH RIVER
DUXBURY BAY
PROVINCETOWN HARBOR

FIGURE B-1

3. Water Quality

The water quality of the Foul Area has been evaluated by the New England Aquarium (1975). The data gathered indicate that the temperature regime is seasonally dependent, with a thermocline developing during late April and May, peaking in August and September and weakening during the late fall. At that time, a 13.5°C temperature difference was noted in the water column. Data for salinity showed little change during the fall and winter, but a decline during the spring was noted presumably due to fresh water inputs from the Merrimack River. The background salinity for the area is 32.2 ppt. Dissolved oxygen levels were found to be influenced by the various periods of primary production and plankton die-off. The lowest concentration was noted to be 6.82 mg/l at the surface during April. The fall decline throughout the water column is attributed to increased levels of respiration while the influence of the spring and summer blooms are clearly evident. During the summer, oxygen levels have been noted to be above saturation at some locations. The nutrient relationships also reflect the influence of phytoplankton growth and die-off, particularly as the level of phosphorus declines sharply and the nutrient becomes limiting in the trophogenic zone. There are rising concentrations of nutrient material during the summer below the thermocline, and increased concentrations of ammonia have been found at the bottom of the water columns during disposal of dredged material. Average annual nutrient levels are indicated in Table 1.

The average annual metal levels for the Foul Area waters are also exhibited in Table 1 (New England Aquarium, 1975). With the exception of periods during which dredged material was being dumped, trace metal levels were within acceptable levels. Lead did, however, reflect some seasonality, and significant differences in the concentrations of other metals were detected between stations and at certain depths.

4. Sediments

Sediments in the Foul Area are primarily composed of fine grained silts and clays with some sand and gravel in the northeast portion of the area. Schlee and Butman (1974) indicate that bottom sediments are generally in equilibrium with the maximum observed current speeds.

Acoustic profiling of the areas in Stellwagen Basin, where the Foul Area is located, indicates that thick deposits of recent sediments are accumulating in the basin (Tucholke et al, 1972). The authors suggest that the basin is a natural sediment accumulation area for fine-grained terrigenous sediments from the Massachusetts coast, perhaps from as far away as the Merrimack River.

TABLE 1

Water Quality of Boston Foul Area 1973-1974*

	Minimum	Annual Mean	Maximum
Nitrate N (ppm)	.001	0.003	0.010
Nitrate N (ppm)	.0001	0.105	0.260
Ammonium N (ppm)	.022	0.045	0.112
Ortho Phosphate (ppm)	.001	0.025	0.050
Lead (ppm)	.1	2.3	1.4
Zinc (ppm)	2	21	69
Cadmium (ppm)	.05	0.3	1.0
Chromium (ppm)	.1	0.4	1.1
Copper (ppm)	.3	2.3	7.0
Nickel (ppm)	.2	1.8	6.5

*Data from New England Aquarium (1975)

The chemical properties of the Foul Area sediments also were documented by the New England Aquarium (1975). Reasonable consistencies were found in the concentrations of some metals between the sample locations. There were others, however, that varied by several orders of magnitude. The average chemical characteristics of the Foul Area sediments are presented in Table 2. By comparison with Boston Harbor it can be seen that the sediments have a relatively moderate to high level of volatile solids but a low level of oil and grease.

There are also low concentrations of mercury, lead, zinc, chromium, copper and vanadium. The concentrations of nickel, cadmium, and arsenic are moderate to high in relation to the Boston Harbor project areas. In comparison to other marine environs, such as Buzzards Bay (Table 2), the trace metal levels at the Foul Area are elevated over what could be considered background concentrations commensurate with the hydrogeological regimes of the area.

B. Endangered Species

Data from an annual report prepared for the Bureau of Land Management indicates that Stellwagen Bank (east of the Foul Area) is used by two species of turtles and three species of whales (URI, 1981).

The leatherback turtle (Dermochelys coriacea) and the loggerhead turtle (Caretta caretta) are designated by the National Marine Fisheries Service (NMFS) as endangered and threatened, respectively. Although sitings of both species have been documented in Massachusetts Bay, the loggerhead is more commonly found to the south of the Bay while the leatherback, is more common east and south of the Bay area. The disposal site area is not commonly used by these species. Sitings of a third turtle, the Kemp's ridley (Lepidochelys kempi), have also been recorded in the past but this species prefers shallow water inshore areas (Cape Cod) and does not use the outer Massachusetts Bay for feeding (NMFS, personal communication).

All three species of whales, the humpback, (Megaptera novaengliae), the finback whale (Baleanoptera physalus), and the right whale (Eubalaena glacialis) are all designated as endangered. The right whale is more commonly found east and south of the area and are not considered potential heavy users of the disposal site area. NMFS has indicated that the Stellwagen Bank area is extensively used as a feeding ground by the humpback and finback whales from May through October. Therefore, the latter two species are of concern and will be discussed below:

It has been estimated that there are approximately 2,000 humpback whales in the northwest Atlantic Ocean. Based on studies by the University of Rhode Island (1981) for the year 1979, at least 600 of this population use the Stellwagen Bank area for feeding and nursing of calves from May through the fall. The movements of these animals are thought to be closely associated with their primary food species the sand lance (Ammodytes americanus) which have suitable habitat in the clean sand and waters above the Stellwagen Bank (Kenney et al., 1981).

TABLE 2

Comparison of the Sediment Quality of Boston Foul Area With Boston Harbor and Buzzards Bay Sediments

Location	Composite of Boston Harbor Sediments (1)	Composite of Boston Foul (2)	Buzzards Bay (3)
Soil Description	Silty Clay	Silty Clay	-
% Vol. Solids EPA	7.39	7.62	4.2
Oil and Grease (ppm)	5,913	940	195
Mercury (ppm)	1.0	0.59	0.21
Lead (ppm)	88	60.94	22.8
Zinc (ppm)	165	140.44	75.1
Arsenic (ppm)	14.2	13.25	2.8
Cadmium (ppm)	4.3	3.43	1.6
Chromium (ppm)	138	73.75	29.1
Copper (ppm)	89.7	21.13	10.9
Nickel (ppm)	30.8	37.56	20.0
Silver (ppm)	189.4	-	-
Vanadium (ppm)	114	53.69	47.5
PCB (ppm)	420	52.13	193.00

(1) Corps of Engineers, 1980 data
(2) New England Aquarium (1975)
(3) Summerhayes (1977)

There is also an estimated 3,600-6,300 finback whales in the northwestern Atlantic Ocean. The (URI 1981) study indicates that 1,100 individuals may use the Massachusetts Bay area. This species is found in other areas of the Bay (eg. Jeffrey's Ledge; off Cape Cod) more commonly than the humpback whale. It, therefore, is not as an exclusive user of the Stellwagen Bank area as the humpback. This may be associated with its wider variety of preferred food species which include krill, capelin, squid, herring and lanternfish (Leatherwood et al., 1976).

Individual sitings of both species based on available data derived from (1) the URI (1981) report for the year 1979 and (2) the 1981 data compiled by Mr. Mason Weinrich, Principal Investigator for the Cetacean Research Unit Grant, are plotted on Figure 1. The latter was furnished by the NMFS and included only the humpback species. The latest information collected by URI is not currently available. The sitings are generally concentrated 3-4 nautical miles (nm) east and northeast of the Foul Area. No sitings were within a 2 nm radius of the discharge buoy. The sitings are generally found in shallower water areas (associated with the northern extreme of Stellwagen Bank) where the schooling sand lance are more likely to be found.

IV. IMPACTS OF DISPOSAL

A. The Action of Disposal

The dredged material is released through bottom opening doors in the scows and deposited at the dump site. The movement of sediments through the water column has been described by Gordon (1977). Briefly, upon release from the scow, the dredged material descends rapidly to the bottom. The speed of descent and the size of the bottom spreading depends on many factors, including the mechanical properties of the sediment, water percentage of the sediment, depth, bottom conditions, ambient currents, etc. Gordon also indicates that ambient current conditions are important because such a large volume of ambient water is collected during descent that the material flow will acquire the ambient lateral velocity of the water. Upon impact, a turbidity (density driven) current will be set up which will spread outward until friction forces cause it to halt. Monitoring at the Portland Ocean disposal site off of Maine, which is in approximately 200 feet of water, has indicated formation of a mound with a lateral spread of about 200 meters (600 feet) from the discharge buoy. A similar spread of 250-275 meters would be expected at the Foul Area disposal site in its 300 feet of water.

B. Alteration of the Environment

1. Water Quality

The impacts of the water quality associated with dredged material disposal are a temporary and local increase in suspended solids and sediment contaminants.

a. Turbidity

Release of the dredged material would create a turbidity plume of fine loose and clumped material into the water column. Studies during disposal at the Boston Foul Area by New England Aquarium (1975) indicated that suspended solids were highest near the bottom of the water column. However, the levels of turbidity did not adversely affect primary production. Gordon (1974) found that only 1% of the total volume of dredged material at a site in Long Island Sound remained suspended in the water column after disposal.

b. Release of Contaminants

The mixing of the anoxic sediments during descent and impact on the bottom may release nutrients, petroleum hydrocarbons, metal and chlorinated hydrocarbons into the water column. Elutriate testing indicated worst case potential release of ammonium nitrogen, phosphates, oil and grease, mercury, zinc, lead, arsenic and PCB's. The nutrient releases were marginal which may cause only localized increases in phytoplankton productivity. Metal releases were all within EPA guidelines.

Release of PCB's were above the 24-hour average (0.03 ppb) (EPA 1980). However, this level is a worst case estimate because: (1) a clamshell dredge will be used which minimizes mixing of sediments with the water because the dredged material is dumped from scows in relatively cohesive masses and (2) dilution by the water column during disposal would probably reduce levels down to acceptable standards. The elutriate test indicated that Station A sediments of the Mystic River showed the highest release of PCB's, 13.2 ppb. Formula "H5" in Appendix H of the EPA/CE guidelines (EPA/CE, 1977) is suggested for determination of the volume of disposal site water necessary to dilute the discharge liquid phase to acceptable levels. Assuming a barge load of 1,500 c.y. and a worst case release of 13.2 ppb into the water column, approximately 452,700 c.y. of water would be required to dilute released PCB's down to acceptable EPA 24-hour average guidelines. A "cylinder" of water around the discharge buoy (radius: 2 50 m (275 y) and depth: 80 m (84 y)) would contain a volume 2.05 x 10^7 c.y. of sea water. This volume would be more than enough to dilute the worst case releases to background levels outside the "cylinder". In actuality, less would be required because of the clamshell dredging method.

1. Sediment Quality

The action of disposal would displace dredged sediment from the harbors to the dump site. This action would not significantly change the present character of the dump site sediment since the area has been used as a dump site for a number of years. The dredged sediment analyses may be compared with the sediment analysis of the Boston Foul Area (New England Aquarium, 1975) (Table 2). Disposal of the dredged sediment would not change the Foul Area sediments because of the similarity of the sediment textures. Comparison of contaminant levels indicate that disposal of the harbor sediments could introduce relatively higher levels of oil and grease, mercury, chromium, copper, vanadium and PCB's to the dump site sediments. Other constituents are only moderately higher or lower (nickel) than the Foul Area sediments.

Generally, metals are bound to organic oxides, sulfides, or are absorbed to or part of the crystalline structure of sediment particles; hydrocarbons are bound to organic particulates and fine sediments. These are generally unavailable to organisms in these forms and, therefore, would not be of concern. Point discharge would mound the harbor sediments so that most of the sediments would not be exposed to the water column. However, disturbance of the sediment could oxygenate the anoxic sediments causing releases of some metals into the water column. PCB's are strongly bound to organic particulates and are mostly insoluble in water. Resuspension of the particulates could increase the PCB concentration in the water column (Fulk _et al_., 1975).

Two factors which may resuspend mounded sediments over the long term are bottom currents and biological activity.

The sediments of the Foul Area have been characterized as fine sediments which are indicative of areas of deposition and low bottom currents. Studies by Schlee and Butman (1974) indicate that, at the majority of sites where currents have been measured in Massachusetts Bay, bottom sediments are in equilibrium with the maximum observed current speed. Thus, it appears that average current velocities (Section III) at the Foul Area are not great enough to cause significant movement of dredged material deposited there because the threshold velocity to resuspend silty dredged sediments (35-45 cm/sec, (Corps of Engineers, 1981)) is higher than the average or maximum current velocities at the site. Acoustic profiling by Tucholke et al. (1972) indicates that tens of meters of fine materials have accumulated in Stellwagen Basin since the Pleistoncene Epoch. It is his opinion that this area acts as a natural sediment sink for fine grained particles. Butman (1975) indicated that storm waves may induce bottom currents in the opposite direction of the wind. Such currents would not be of sufficient magnitude to resuspend a significant volume of already deposited material. The suspended load of these currents could be significant only during disposal operations. Disposal activities would not take place during heavy winter storms because of rough water. Thus, based on the low magnitude of the currents in the Foul Area, little or no resuspension and movement of the deposited sediments from the discharge area is expected. Further, even if movement of sediments did occur, the magnitude of currents on Stellwagen Bank would not allow any deposition of the sediments to take place.

The mound would be recolonized by opportunistic benthic organisms soon after disposal. Rhoads and Young (1970) found that the burrowing, respiration and feeding activities of these organisms can rework and stir the sediments down to about 10 cm in depth. Such activity could cause minor releases of sediment contaminants which would be quickly diluted by the bottom currents. Potentially available contaminants down to the 10 cm depth eventually would reach an equilibrium with the water column concentrations. Unless the mound is disturbed, the contaminants below this depth could remain sequestered indefinitely.

C. Impacts on Organisms

1. Physical Effects

a. Turbidity

The increased levels of suspended solids during disposal operations would be short term and localized. The impacts of disposal on phytoplankton were monitored at the Foul Area during disposal operations in 1973 (Martin and Yentsch, 1973). The authors found no evidence to suggest that the natural seasonal fluctuations of phytoplankton were disturbed. The temporary increase in suspended solids during disposal operations has not been shown to have an appreciable adverse affect on finfish. Stern and Stickle (1977) concluded that most field investigations on the effects of dredging and disposal operations on fishes, their patterns of seasonal occurrence, abundance, and species diversity generally remained similar to that of control areas where no such operation occurred.

Finfish and invertebrates which use the disposal site as habitat or its benthic organisms for forage would be affected by disposal operations. Such habitat and forage would be temporarily lost upon disposal. This loss would be minimal and localized to the immediate disposal site. Benthic eggs, larvae, juveniles, as well as many adults within the affected 0.05 square mile disposal area would perish. Mobile forms not directly dumped on would be expected to avoid the immediate disposal area and would therefore survive.

2. Chemical Effects

Bioassay and bioaccumulation tests were performed on the sediments to be dredged to measure the potential of toxicity and uptake of sediment contaminants on representative organisms.

Analysis of the test results for all areas indicates that: (1) there was either no statistical difference between the mortalities of the test and control organisms, or (2) if there was a statistical difference in mortalities, a dilution analysis (Appendix H, EPA/CE 1977) showed that any toxic substances would be diluted to acceptable levels (0.01 of the concentration which causes 50% mortality) within four hours of disposal.

Bioaccumulation tests indicated potential uptake of mercury and petroleum hydrocarbons by the filter feeder, *Mercenaria mercenaria* and cadmium by the deposit feeder *Nereis virens*. However, the levels of uptake were (1) within FDA action levels in the case of mercury and (2) within the range of baseline tissue levels and/or the range of non-statistically significant tissue levels for petroleum hydrocarbons and cadmium.

A related major concern is the potential for predators to carry contaminants outside of the disposal area via prey with contaminated tissue. For this to occur on a significant scale, the contaminant would have to be transferred and magnified through the food chain. There is no evidence that contaminants associated with dredged material are biomagnified through marine food chains. Further, studies have indicated that petroleum hydrocarbons (Burns and Teal, 1973) and cadmium (Macek *et al.*, 1979) are not biomagnified in aquatic food chains.

As a biologically conservative measure, sediments from the inner harbor areas (Mystic River and Chelsea River) will be dredged first and covered with sediments from the President Roads area. Isolation of the more contaminated dredged material from immediate long term contact with the water column should provide an extra measure of protection against potential bioaccumulation of contaminants. The disposal area would also be monitored for potential bioaccumulation by incorporation of the "mussel watch" program by the Corps of Engineers DAMOS program.

3. Endangered Species

The humpback and finback whales are present in the Stellwagen Basin area during the late spring, summer and early fall months. Based on the maximum June and July densities of these species recorded for the outer Massachusetts Bay area (area "A" of the URI, 1981 report), the expected density of individuals within a 2 nautical mile radius (12.5 nm^2 or $43/km^2$) of the discharge buoy would be 0.73-1.25 individuals for each species in June and July. This assumes an equal distribution of animals throughout the Bay area which is not the case. The sitings are in an area 3 to 4 nm north and east of the disposal site (Figure 1). For the purpose of this discussion, we can assume as worst case analysis that one or two individuals may be present within the 12.5 nm^2 area. Section II of this report indicated that work during July and August would probably involve two discharges per day and work in September would involve one discharge per day. Consequently, the longest period of disposal activity concurrent with the period of whale activity would be on the order of 5-10 minutes per day. The low chance of encounter would result in a low probability of impact to feeding individuals in the area.

The increased boat traffic in the area would slightly increase the chance of collision with "logging" whales at the surface. However, several of the preferred areas - Jeffrey's Ledge, Stellwagen Bank, the Provincetown Slope, and Great South Channel in particular - lie directly in the main shipping lanes to Boston, Massachusetts and other Gulf of Maine seaports. The fact that the animals continue to concentrate on these feeding banks, and utilize these migration routes in spite of the present high level of vessel traffic, supports the theory that feeding and migrating whales do not exhibit significant avoidance behavior to general ship traffic. Therefore, any increase in such traffic due to disposal is unlikely to affect significantly the species using these areas especially since we will not be transiting through the bank area but only to a point to the west and then turning and returning to port.

If by chance an endangered species is dumped on during disposal activities, the effects on that organism would be unknown. No studies have been concerned with the effects of suspended dredged material on whales or turtles. The University of Guelph, Ontario, is preparing to conduct experiments on the effects of petroleum and drill cuttings on the integument of dolphins for the Bureau of Land Management. The studies have not yet begun and would have little applicability to the effects of dredged material (David St. Aubin, personal communication).

There is some concern about the possibility of impacts on the food species of the endangered species. Based on the number of sightings in the Stellwagen Bank area, the species most likely to be present in the vicinity of the disposal site would be the finback and humpback whales (URI, 1981). Humpbacks and to a certain extent finback whales feed on the sand lance (_Ammodytes americanus_) which have markedly increased in numbers in the Bank area since 1975 (Meyer _et al_. 1979).

Impacts to the sand lance may be broken down in the three aspects of their life activities: (1) daily activities in terms of schooling and burrowing, (2) their food source, and (3) reproductive habitat.

Most of the daily activities of the sand lance involve either swimming in schools or burrowing in suitable substrate. Impacts to their natural schooling movements are likely to be short term and localized. As mentioned above, the short time that disposal would actually take place (5-10 minutes per day) and the small affected area involved (0.05 nm^2 or 0.0005% of Massachusetts Bay) would reduce the chances of encounter with a passing school. It is likely that the school would avoid the disposal induced disturbance and not be affected because of their high mobility.

The sand lance also spends a portion of its time burrowing in the sand. It has a marked preference for clean sand and fine gravel substrate (NMFS, personal communication). The entire Foul Area dump site sits in a basin (Figure 1), which is made up of primarily silty clay (anthropogenic and naturally occurring) with associated currents which average 4-5 cm/sec. This area of sediment accumulation is not considered as potential habitat for burrowing sand lance. The best habitat for such activity is on the Stellwagen Bank, east of the disposal site. Because of low magnitude of the currents at the disposal site, the high magnitude of the currents on the Stellwagen Bank, and the 200 foot ridge east of the dump site that isolates the site from the Bank area, resuspension, movement and deposition of dredged material on the preferred burrowing habitat on the Bank would be unlikely.

It is not expected that the sand lance would significantly accumulate sediment contaminants. Approximately 99% of the contaminant-laden sediment would settle to the bottom almost immediately. If any uptake by organisms in the vicinity were to occur, it would occur through the water column. The lack of mixing of the cohesive sediment masses with the water column and the dilution by the water column would reduce any released contaminants to acceptable EPA levels. Studies have shown that release of contaminants during disposal is a short term phenonomen and would return to background levels soon after disposal (Wright, 1978; Burks & Engler, 1978). Due to the high mobility of schooling sand lance which might be in the vicinity of the area during or shortly after disposal and given the level of release expected, it is doubtful that the organism would be sufficiently exposed to the affected area long enough for any significant accumulation to occur. Since it is unlikely that the sand lance would burrow in the deposited sediment, accumulation from the sediments would not be of concern.

Field bioaccumulation studies of bottom fish near or on disposal sites have not indicated any adverse effects. Monitoring of mercury and chromium levels in the edible portions of the tissue of English sole (Parophrys vetulus) prior to and following disposal activity in Puget Sound, Washington indicated no apparent differences in levels (Teeny and Hall, 1977). Studies in the New York Bight Mud Dump have indicated that mercury, cadmium, PCB and pesticide levels in the tissues of the whiting (Merluccius bilinearis) and red hake (Urophysis chuss) were not significantly different from specimens collected at a reference area 10 miles distant from any Bight Disposal activity (Lee and Jones, 1977). Tissue contaminant levels in all cases were below FDA action levels (where such levels have been established). Short and long term monitoring of uptake by mussels at the proposed disposal site would be carried out under the DAMOS program before, during and after disposal. Such monitoring would indicate potential problems of bioaccumulation by prey species.

The food of the sand lance is primarily made up of copepods and other plankton (Meyer et al., 1979). The liquid and suspended solid phase bioassay tests that were performed on the sediments to be dredged indicated no toxicity to the copepod, Acartia clausi, and therefore, should not be a problem.

Few studies on the reproductive habitat of sand lances have been done. However, NMFS (personal communication) has indicated that the usual spawning substrate is again clean sand or fine gravel in about 20 feet of water or less. The Foul Area offers no potential for such habitat and therefore little or no short term impacts and no long term impacts are expected on the sand lance population due to the proposed disposal activities.

V. CONCLUSIONS

Based on the above discussion, it is the finding of this biological assessment that the proposed disposal operation would have minor or no impact to the humpback or fin whales which may use the area. The dredged material disposal would be closely controlled and monitored to insure accurate deposition. This historical disposal site is situated in a deep basin where relatively low bottom currents have made the area a long term fine-sediment accretion zone. Once the material is deposited, the currents are not of sufficient magnitude to significantly erode the mound. No impacts are expected on the preferred habitat located 3-4 nm and east of the disposal site.

The size of the affected discharge area would have about a 250 meter radius around the discharge buoy (0.05 square nm area). This is approximately 0.0005% of the total area of Massachusetts Bay available to the whales for feeding habitat. The density of whales in the 12.5 nm^2 area which the site is located is about 1 individual per species. This represents about 0.16% of the total population of humpback and fin whales which use Massachusetts Bay. Thus, given that (1) the preferred Stellwagen Bank habitat for the whales and sand lance would not be affected, (2) the small size of the affected area, and (3) the small number of potentially affected individuals, minor or no impact to the population of the whales or prey species is expected.

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Center
Woods Hole, MA 02543

July 26, 1982

TO: Richard Semonian - Corps of Engineers

Douglas Beach - F/NER

FROM: John B. Pearce - F/NEC

John B. Pearce

SUBJECT: Meeting on Studies of Dredged Material Disposal, Stellwagen Basin, Woods Hole Laboratory, 26 July

Subject meeting was convened at 11:00 AM, 26 July 1982. Participants at the meeting were:

Richard Semonian	COE
Robert Morton	SAO
Mark Otis	COE
Chris Lindsay	COE
Chris Mantzaris	F/NER
Richard Tomczyk	DEQE/DWPC
Harriet Diamond	MCZM
Douglas Beach	F/NER
John Pearce	F/NEC

The meeting was convened by Mr. Doug Beach, NMFS Regional Office. The site for future disposal of dredged material from Boston Harbor has been designated in Stellwagen Basin, west of Stellwagen Banks. Concern has been expressed for the possible effects of the disposal of dredged material on certain endangered species, principally marine mammals.

It has been indicated that a principal forage for the humpback whale is the sand lance, which have been reported in great abundance on Stellwagen Banks.

Approximately seven hundred thousand cubic yards of dredged material will be removed from the Boston Harbor area as part of federal projects for harbor maintenance and improvement. Private projects will individually result in additional dredged material (see Attachment).

Recommendations were made by NMFS Regional Office in regard to studies that should be conducted in relation to the possible effects of dredged material disposal on marine mammals. The Corps of Engineers (COE) has in place the DAMOS program. Discussions during the present meeting indicated that the COE will furnish to Dr. Pearce and Mr. Beach the protocols and strategy for studies to be done at the Stellwagen Basin disposal site prior to and during the disposal operations. The studies will include analysis of benthic organisms (polychaete worms) and sediments for a range of contaminants, both organic and inorganic. Also, other benthic studies will be performed.

The COE is able to conduct "Mussel Watch" experiments with caged mussels to be located between the dredged material disposal site and Stellwagen Banks. The COE may also be able to use the "daisy" to monitor suspended materials between the disposal site and the Banks.

As part of its Ocean Pulse/MARMAP program, the NEFC will be able to obtain samples of sand lance which will be analyzed for body burdens of contaminants prior to and following the disposal of dredged material.

The Regional Office and Center will make recommendations as to appropriate sampling sites for sand lance based on historical observation of the distribution of this fish, as well as on those areas having high numbers of whales and other marine mammals.

It was agreed that water quality samples, taken at a level that can be supported with present funding, as well as studies of turbidity plumes, would not be appropriate at the present time.

The Regional Office personnel will attempt to collate materials concerned with the distribution and abundance of humpback whales and other marine mammals in the area of concern.

The strategy and sampling protocols for the DAMOS program at the Stellwagen Basin site will be forwarded to NMFS during the week of 26 July. This information is important in terms of future Ocean Pulse efforts within the Massachusetts Bay area generally and for planning future sampling and monitoring efforts in the area. The proposed studies will provide crucial benchmarks for further monitoring activities in Massachusetts Bay and Stellwagen Banks. The importance of early analytical results and distribution of resulting data was noted.

Attachment

cc: R. Hennemuth - F/NEC
T. Azarovitz - F/NEC
R. Rehfus - F/NER

Boston Hbr + vicinity Dredging w/ Disposal at Foul Area (Tentative Schedule 1982) 7 July 82
Revised 15 July 82

Federal Project

Mystic Rvr (200,000 cy) may begin late July, complete mid-late August

Chelsea Rvr (25,000 cy) may begin mid-late August, complete Sept.

President Roads (565,000 cy) may begin Sept., complete

Weymouth Fore Rvr (31,000 cy) finish week of 5 July

Private Projects

Permitted

* Boston Edison, permit 82-193 (9,000 cy) Chelsea Rvr - must be complete before federal project in Chelsea Rvr begins

* Schiavone + Sons, permit 82-218 (17,000 cy) Mystic Rvr

¤ Gulf Oil, permit 81-458 (33,000 cy) Chelsea Rvr

¤ Braintree Yacht Club, permit 82-198 (9,600 cy) Weymouth Fore Rvr, complete 14 July

Richard Thayer, permit 82-072 (1,580 cy) Weymouth Fore Rvr

Applications in progress or proposed

¤ Boston Edison, appl. 82-098E (85,000 cy) Mystic Rvr

¤ Exxon, appl. 81-619 (1,000 cy) Mystic Rvr

¤ Pittston Petro, appl. 81-484E (15,000 cy) Mystic + Chelsea Rvrs

¤ North Eastern Petro, appl. 82-342 (18,000 cy) Chelsea Rvr

¤ Eastern Minerals, appl. 82-262 (8,600 cy) Chelsea Rvr

General Ship Corp., appl. 81-533 (700 cy) Boston Hbr

¤ Massport, anticipated (50,000 cy) Boston Hbr - Bird Is. Flats

¤ Massport, anticipated (25,000 cy) Boston Hbr - Marine Terminal (North Jetty)

¤ DEQE, appl. 77-508 (15,000 cy) Weymouth Fore Rvr (permit is expected to be conditioned as in *)

DEQE, appl. 82-353 (41,000 cy) Weymouth Fore Rvr

Metropolitan Yacht Club, appl. 82-147 (8,700 cy) Weymouth Fore Rvr.

* Denotes specific projects whose material must be covered with other more suitable material.

¤ Denotes projects whose material is expected but does not require dumping before the Federal project President Roads mat'l.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Center
Woods Hole Laboratory
Woods Hole, Massachusetts 02543

August 18, 1982 F/NEC:JBP

TO: Robert Learson
Acting Laboratory Director

FROM: John B. Pearce
Acting Deputy Center Director

SUBJECT: Samples of sand lance collected for contaminant analysis

As we discussed on the telephone, we recently collected samples of sand lance from positions located on the western margins of Stellwagen Bank. Purpose for the collections was to obtain benchmark data for use in assessing the possible impact of ocean disposal of contaminated dredged materials, on the forage items routinely utilized by certain marine mammals.

The samples were collected according to a standard protocol (see attached) and are presently being held at the Woods Hole Laboratory in a frozen condition.

As soon as it is convenient we will have the samples transported to the Gloucester Laboratory for analysis for PCB's, PAH's, and other organic contaminants known to be toxic to a variety of marine life.

We are also interested in getting total levels of "petroleum hydrocarbons" that might be found in these tissues.

The samples consist of at least 25 sand lance that were taken at each of three stations. The sample collection sites are noted on the attached chart and the station information for the samples is provided on three other attachments for each of the stations that were occupied (these stations are noted as stations 25, 26 and 27.

I am attempting to get information from the Corp of Engineers as to the analytical techniques that they will be using to analyze certain sediment samples for their contaminant burdens. Moreover I wish to get information that indicates what kinds of contaminants will be looked for in the sediment samples. This information will be forwarded to you as soon as it becomes available to this office.

cc: Bob Reid
Frank Steimle
Millington Lockwood
Ruth Rehfus
Marv Grosslein
Chris Lindsey

AUG 26 1982

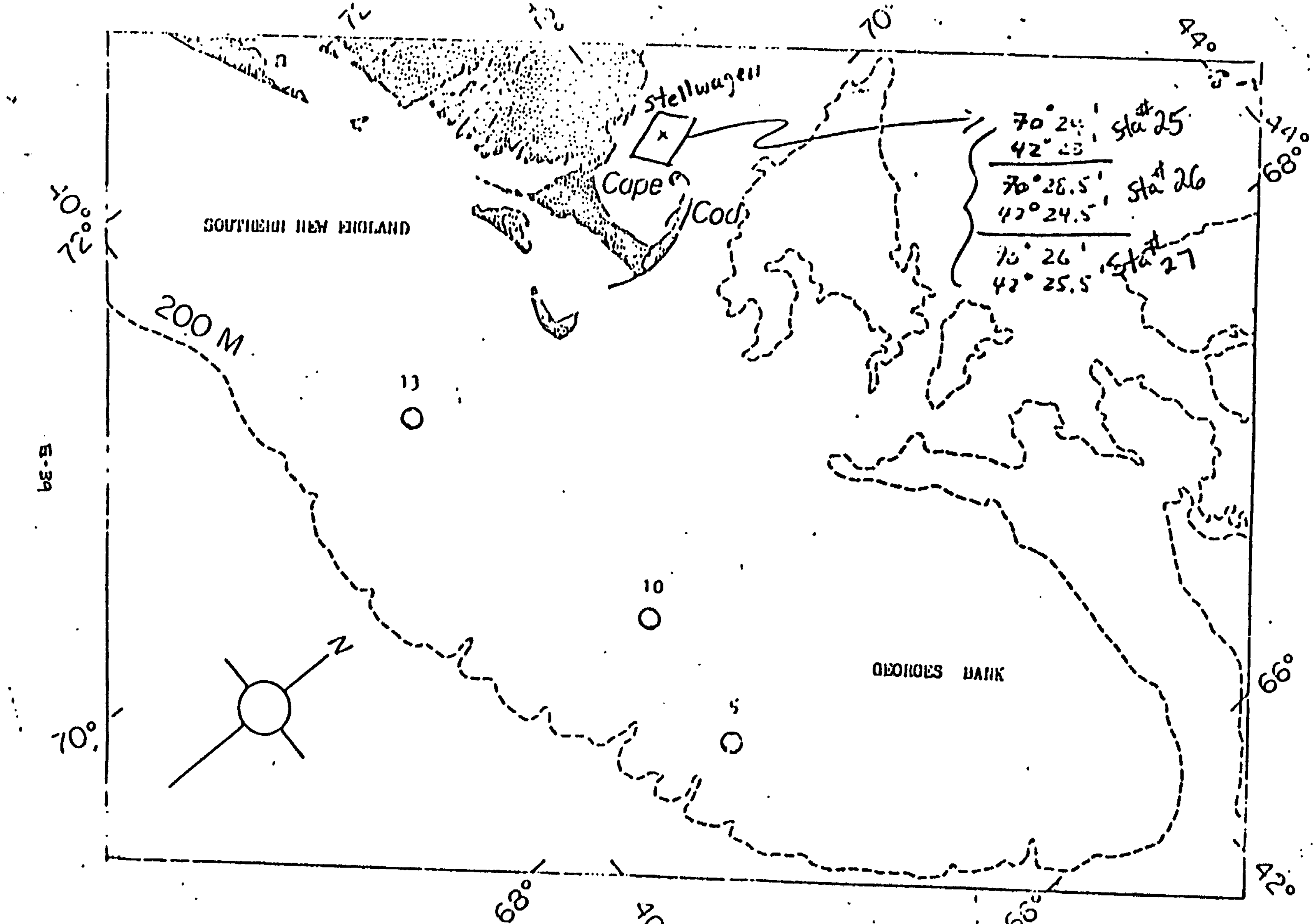

Figure 1. Three food habits study areas (5,10,13) and general location on northern Stellwagen where sand lance to be collected.

Sta# 25

VESSEL	CRUISE	STRATUM-TOW	TRAWL STATION	BT SLIDE NO
[illegible]	82-11	#25	[illegible]	

DAY	MONTH	YEAR	OTHER STATION
15	Aug.	82	

WIND DIR (degrees)	WIND SPEED	DEPTH	
335	10 KTS	Maximum	Minimum

WAVE HEIGHT: 1 FOOT

CLOUD AMOUNT: CLEAR — AIR TEMP:

NOTES ON SHIP OPERATIONS

BUCKET	DOPPLER
SURFACE	W L
BOTTOM	

TRAWL	WIRE OUT	COURSE (deg)	SPEED
Y35	50 FMS	183°C	3.0 KTS

→	TIME	DEPTH	LATITUDE	LONGITUDE	LITTON LOG
START	0205	18 FMS	42°23.3'	70°25.1	
END	0235	17 FMS	42°22.7	70°23.8	

→	LORAN		CONDITION OF TRAWL
START	13[illegible]	[illegible]	
END	13723.7	44235.1	

OTHER GEAR	WIRE OUT	COURSE (deg)	SPEED

→	TIME	DEPTH	LATITUDE	LONGITUDE	LITTON LOG
START					
END					

NOTES ON NET OPERATION

E OUT	CRSE	WIND DIR	WIND SPD	WAVE HGT	DEPTH MIN	DEPTH MAX	TOW DIST	AVG SPEED	

E-40

WATCH CHIEF

Sta #26

VESSEL	CRUISE	STRATUM TOW	TRAWL STATION	BT SLIDE NO.
[illegible]	83-11	#26	[illegible]	[illegible]

DAY	MONTH	YEAR	OTHER STATION
[illegible]	[illegible]	[illegible]	

WIND DIR (degrees)	WIND SPEED	DEPTH	
[illegible]	[illegible]	Maximum	Minimum
WAVE HEIGHT	2 [illegible]		
CLOUD AMOUNT [illegible]	AIR TEMP		

NOTES ON SHIP OPERATIONS

Sal Bottle #9

BUCKET 18.0°C	DOPPLER
SURFACE	W L
BOTTOM	

TRAWL	WIRE OUT	COURSE (deg)	SPEED
1/35	[illegible]	[illegible]	

→	TIME	DEPTH	LATITUDE	LONGITUDE	LITTON LOG
START	[illegible]	17[illegible]	[illegible]	[illegible]	
END	[illegible]	17[illegible]	[illegible]	[illegible]	

→	LORAN		CONDITION OF TRAWL
START	[illegible]	[illegible]	
END	[illegible]	[illegible]	

OTHER GEAR	WIRE OUT	COURSE (deg)	SPEED

→	TIME	DEPTH	LATITUDE	LONGITUDE	LITTON LOG
START					
END					

NOTES ON NET OPERATION

WIND SPD	WAVE HGT	DEPTH MIN	DEPTH MAX	TOW DIST	AVG SPEED

E-41

WATCH CHIEF

RECORDER

Sta # 27

VESSEL	CRUISE	STRATUM-TOW	TRAWL STATION	BT SLIDE NO.
[illegible]	82-11	— 27	[illegible]	

DAY	MONTH	YEAR	OTHER STATION
15	Aug.	82	

WIND DIR (degrees)	WIND SPEED	DEPTH Maximum	DEPTH Minimum
320	[illegible]		

WAVE HEIGHT 2 ft

CLOUD AMOUNT	AIR TEMP
0%	

NOTES ON SHIP OPERATIONS

Bottle # CME

BUCKET 18.0°C

SURFACE

BOTTOM

DOPPLER W L

TRAWL	WIRE OUT	COURSE (deg)	SPEED
1/[illegible]	[illegible]	[illegible]	[illegible]

→	TIME	DEPTH	LATITUDE	LONGITUDE	LITTON LOG
START	0543	125 ft	[illegible]	[illegible]	
END	0612	138 ft	[illegible]	[illegible]	

→	LORAN		CONDITION OF TRAWL
START	[illegible]	[illegible]	
END	[illegible]7	[illegible]	

OTHER GEAR	WIRE OUT	COURSE (deg)	SPEED

→	TIME	DEPTH	LATITUDE	LONGITUDE	LITTON LOG
START					
END					

NOTES ON NET OPERATION

WIND SPD	WAVE HGT	DEPTH MIN	DEPTH MAX	TOW DIST	AVG SPEED

E-42

WATCH CHIEF

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northeast Fisheries Center
Woods Hole, MA 02543

August 6, 1982

TO: Marvin L. Grosslein

FROM: John B. Pearce

SUBJECT: Sampling Protocol

Sand lance and other sentinel species will be collected at sites indicated on the attached chart and located along the western border of Stellwagen Bank. For your information, the coordinates of the buoy marking the dumpsite are 42 degrees 25.65' N X 70 degrees 34.80 W. Loran coordinates are 13850.7, 25717.8, 44270.2. The buoy is orange and white with a reflector and 4-second light. It is marked with a large "DG."

Sand lances are to be taken whole and approximately 20-25 fish of at least one size group should be wrapped in aluminum foil and frozen. Such a collection will be made at each of the three trawling sites. If two quite different sizes of fish are taken at each site, 20-25 individuals of each size group should be wrapped as previously noted.

If yellowtail flounder, cod, or haddock are taken in reasonable abundance, fillets should be removed from each of the fish taken at a trawl site and placed in aluminum. Each species of fish should be wrapped separately and the contents of the package appropriately noted on a label placed in an exterior plastic bag surrounding the aluminum wrapped fish.

If possible, livers from these same species should also be removed and the livers from each species at a trawl site again wrapped in aluminum foil with proper labels.

Precautions:

1. The fish should not come in contact with nets, head lines, deck, or other vessel equipment. If possible, the engines should be shut down or at least the vessel positioned so that exhaust fumes are carried away from the deck.

2. Only the aluminum material provided should be used for wrapping the fish; the sand lance has first priority in case there is insufficient wrapping material.

3. Personnel handling the fish should, as much as possible, avoid the contact of fish by hands, clothing, etc. Large forceps and dissecting scalpels or knives should be rinsed in acetone before being used for dissecting or handling individual fishes.

4. As noted, the fish should be wrapped in aluminum and placed in tied plastic bags (hopefully transparent). A legible label with information on site location, species (size, etc.), number of individuals, should be placed in the respective bags.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

OCT 6 1982

F/MM2:PAC

Colonel C. E. Edgar, III
New England Division
Corps of Engineers
Department of the Army
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Edgar:

Enclosed is the Biological Opinion prepared by the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act of 1973 (ESA) concerning impacts on endangered and threatened species from the proposed maintenance dredging of three navigational channels in Boston, Massachusetts harbor and disposal of dredge material at the "Foul Area" disposal site in Massachusetts Bay.

Based upon information provided in the Environmental Assessment (December 1981), the Biological Assessment (March 1982) and other available information, the NMFS concludes that the proposed activity is unlikely to jeopardize the continued existence of the endangered and threatened species inhabiting Massachusetts Bay. However, we acknowledge the possibility that oceanographic conditions at the disposal site may vary during the project period and alter the basis for this opinion. In addition, the NMFS believes that the Stellwagen Bank food chain, involving the North Atlantic humpback whales and their prey species, the American sand lance, is vulnerable to environmental pressures. Therefore, we recommend that the COE undertake adequate monitoring of dumping activities to determine if dredged material remains contained in the designated area throughout the project period.

Consultation must be reinitiated if there are subsequent modifications to the proposed action or if a species or critical habitat that may occur in the area of the proposed activities is subsequently listed, or if new information reveals impacts of the identified activity that may affect listed species.

We look forward to continued cooperation in future consultations.

Sincerely yours,

William H. Stevenson

for William G. Gordon
Assistant Administrator
for Fisheries

Enclosure

OCT 13 1982

NATIONAL MARINE FISHERIES SERVICE

Endangered Species Act

Section 7 Consultation -- Biological Opinion

AGENCY: U. S. Army Corps of Engineers.

ACTIVITY: Maintenance dredging in Boston Harbor and disposal at "Foul Area" ocean disposal site in Massachusetts Bay.

CONSULTATION CONDUCTED BY: National Marine Fisheries Service.

DATE ISSUED: 6 OCT 1982.

BACKGROUND:

The New England Division of the U. S. Army Corps of Engineers (COE) published a public notice dated September 22, 1981, concerning the proposed maintenance dredging of three navigational channels in Boston, Massachusetts harbor with disposal to occur at the "Foul Area" ocean disposal site in Massachusetts Bay. In a letter dated December 21, 1981, the COE stated that the proposed project would not affect endangered or threatened species in the area. The National Marine Fisheries Service (NMFS) Northeast Region disagreed with this assessment in a letter dated February 23, 1982, and requested that the COE initiate a formal consultation under Section 7 of the Endangered Species Act of 1973, as amended (ESA).

Informal consultation continued, during which detailed information on the distribution and abundance of endangered and threatened species in the area of the disposal site, and the details of the proposed project were exchanged by the staffs of the COE New England Division and the NMFS Northeast Region. Formal consultation was initiated by the COE with submission of a Biological Assessment (Attachment 1) on March 16, 1982.

The major area of concern in this consultation is the disposal of variably polluted dredged material from Boston Harbor, into the "Foul Area" disposal site. The Foul Area was designated as an interim ocean disposal site by the Environmental Protection Agency (EPA) in January 1977 (42 Fed. Reg. 2462-2490). This Massachusetts Bay site is adjacent to Stellwagen Bank, where baleen whales have been found to feed extensively during the summer months. This consultation involves only this proposed dredging project. The potential impacts of long-term ocean disposal at this site are being discussed with EPA.

LIST OF SPECIES THAT MAY OCCUR IN PROJECT AREA:

Consultation was requested for the endangered species listed below. No other listed species for which the NMFS is responsible occur in the project area. There are no species proposed for listing, nor is there any designated critical habitat in the area covered by this consultation.

Endangered

Fin Whale	Balaenoptera physalus
Humpback whale	Megaptera novaeangliae
Right whale	Eubalaena glacialis
Atlantic ridley sea turtle	Lepidochelys kempii
Leatherback sea turtle	Dermochelys coriacea

Threatened

Loggerhead sea turtle	Caretta caretta

BIOLOGY AND DISTRIBUTION OF SPECIES:

Information on the biology of the species listed above and the best available scientific information on their temporal and spatial distribution and abundance in the general area of the project are presented in the 1979 Annual Report of the Cetacean and Turtle Assessment Program (CETAP) submitted by the University of Rhode Island to the Bureau of Land Management in April 1981 (URI, 1981). Additional data is found in "Biology of the Humpback Whale: Northern Stellwagen Bank, Summer 1981" by Mason Weinrich of the Cetacean Research Unit of the Gloucester Fishermens Museum (Weinrich, 1982).

DESCRIPTION OF PROPOSED ACTION:

The Biological Assessment prepared by the COE (Attachment 1) describes the proposed action in detail. The COE proposes to maintenance dredge the Mystic River and Chelsea River Channel and President Roads Anchorage in Boston Harbor to the federally authorized dimensions. This project is presently estimated to involve removal of 720,000 cubic yards (cy) of dredged material for disposal. Dredging will be accomplished by a clamshell dredge that will place material on scows to be towed to the Foul Area for disposal.

The proposed dredging is scheduled to start in September 1982 in the Mystic River Channel. Two scows per day would be discharging at the Foul Area during this two month phase of the project. The Chelsea River Channel would be dredged next and would involve disposal at the rate of one scow per day during that month. The President Roads Anchorage would be dredged later in the fall and would involve 3-4 scows per day discharging at the Foul Area for the three month duration of this phase. Weather factors will play an important role in the ability of scows to be towed to the Foul Area during late fall. The COE also states that a number of private and municipal dredging and disposal projects in the Boston Harbor area will also take place during this period. These projects involve a maximum of 166,000 cy of additional dredged material that may be disposed in the Foul Area this year.

The scows to be used for disposal will have an average capacity of 1,500 cy and will be rigged with bottom opening doors. Loading of the scows by clamshell dredge does not allow the material to become extensively rehydrated. Therefore, the material will maintain its cohesive mass during disposal and allow a minimum of mixing and suspension to occur as it descends to the bottom.

The COE also proposed to use a "capping" technique of disposal designed to lay down the more contaminated materials from Mystic and Chelsea Rivers and several of the other smaller projects first, and then cap or cover these materials with the relatively cleaner material from President Roads Anchorage. Capping has been attempted at other ocean dumping sites with reported success. However, it has never been attempted in water at the depths found at the Foul Area (300'+). A taut wire buoy will be used to accurately position the scows, and a monitoring program is planned to assess the formation of the mound and cap.

The COE, through their ongoing Disposal Area Monitoring System (DAMOS) program, intends to conduct various studies on this project. Included in their planned program for monitoring disposal of the Boston Harbor material are studies to assess pollutant levels in the sediment and the benthic fauna that inhabit the Foul Area and other areas adjacent to it. Detailed bathymetric data will be collected, and side scan sonar and remote cameras will be used to determine the formation of the mound and accuracy of the capping efforts. A "mussel watch" study may be undertaken to determine the rate of bioaccumulation at the site.

POTENTIAL IMPACTS ON SPECIES:

The Biological Assessment submitted by the COE discusses in detail the potential impacts of the project on the endangered and threatened species in the area. The COE's assessment concludes that the proposed disposal of dredged material into the 300' deep basin at the Foul Area site will not significantly affect either the whales that feed on Stellwagen Bank or the prey species they rely on.

Dredging operations within the Boston Harbor area (Mystic River, Chelsea River, and President Roads Anchorage) are not likely to affect any of the endangered or threatened species listed above. Vessel traffic connected with the disposal operation will not significantly add to the existing Boston Harbor traffic load and does not traverse known areas of abundance for the species listed. Therefore, there will be no additional adverse effect to endangered or threatened species due to increased vessel traffic.

The Foul Area ocean disposal site is located 22 nautical miles east of Boston (see Figure 1 in Attachment 1). The site is within the Stellwagen Basin at one of its deepest points. The bottom rises gradually from the disposal site to the west toward Boston and ascends sharply to the crest of Stellwagen Bank, 1-3 miles to the east. The composition of the bottom is fine grained silts and clays at the site while the sediments on Stellwagen Bank are mostly sand. Bottom currents at the site were generally shoreward and slower (15-17 cm/sec) than currents on Stellwagen Bank (32-47 cm/sec).

The Foul Area ocean disposal site has been used historically as a dumpsite for dredged material and industrial wastes. The chemical properties of the Foul Area are elevated above other marine sediments such as Buzzards Bay (see Table 2 in Attachment 1). No data on the background chemical properties of ocean sediments in the Stellwagen Bank area were provided. However, it is reasonable to assume that levels are generally lower on Stellwagen Bank than in the Foul Area site in Stellwagen Basin or in an inshore area like Buzzards Bay.

Chemical analysis of a composite of sediment samples taken at the three Boston Harbor sites indicate levels generally similar to those at the disposal site. Therefore, the proposed project may not make the sediment quality at the Foul Area site any worse. In addition, the COE's Assessment states that bottom current velocities at the disposal site are generally lower than the threshold velocities necessary to resuspend the disposed sediments once they are stabilized.

The Assessment concludes that the disposed sediments, once stabilized, are not likely to be moved by bottom currents. The COE also measured the current velocities on Stellwagen Bank and concluded that if the fine grained dredged material were to somehow reach the high-energy Bank, it could not remain long.

The basic conclusion in the Biological Assessment is that the dredged material will be dumped at Foul Area in approximately 300' of water, and that the combination of oceanographic conditions in the area will prevent the material from drifting toward or otherwise affecting the Stellwagen Bank area over the long term.

The NMFS generally agrees with the COE's conclusion. However, one area of concern regarding the proposed project is the total magnitude of the material to be disposed (720,000 cy on top of several smaller projects that may total an additional 166,000 cy) and the fact that the project will continue throughout the fall. Our concern is that continuous dumping over several months may set up a persistent plume in the water column that could move across the Bank with tidal currents. The COE states that 99% of the dredged material will descend immediately to the bottom. However, 1% of this project could total 7,200-8,860 cy of material that will be suspended in the water column during the project, and therefore become available to the whales and their prey species. Furthermore, the continuous disposal operation will not allow the accreting mound to stabilize until all disposal is complete. This would mean that during the period of disposal, the disposed material will be continuously disturbed by subsequent loads, creating a continuously unsettled condition at the bottom. This would increase the release of contaminants into the water column during the disposal period. The Foul Area disposal site should be closely monitored to ensure that the oceanographic conditions described by the COE in Attachment 1 as sufficient to prevent dredged material from adversely affecting the Stellwagen Bank environment, remain valid during the large volume disposal operation.

CONCLUSION:

Based upon review of the information provided by the COE in their Environmental Assessment of December 1981, and the Biological Assessment of March 16, 1982, as well as other information available to the NMFS, it is our Biological Opinion that the proposed maintenance dredging of Mystic River, Chelsea River and President Roads Anchorage navigational channels in Boston Harbor, and the disposal of the dredged material at the Foul Area ocean disposal site, is not likely to jeopardize the continued existence of the endangered and threatened species known to inhabit Massachusetts Bay. The following factors form the basis for this conclusion:

1. The right whale is a common visitor of Massachusetts Bay in early spring and again in late fall. However, it is not expected to be found in the area of the disposal or dredging sites during the project period.

2. The ridley and loggerhead sea turtles are occasional visitors to Massachusetts Bay from mid-summer to early fall. However, they are usually found in the inshore areas of Cape Cod Bay and are unlikely to be found either in the area of dredging or disposal operations.

3. Leatherback sea turtles may traverse the disposal area but are not known to congregate in Massachusetts Bay.

4. Fin and humpback whales spend a great deal of time in the vicinity of the disposal area. They appear to represent the highest tropic level of a food chain that utilizes the high-energy banks that form the offshore border of Massachusetts Bay. The whales appear to feed exclusively on the sand lance (*Ammodytes americanus*) during their stay on these banks in the summer.

5. The clean sand substrate that provides habitat for sand lance on Stellwagen Bank will not be significantly threatened by the proposed disposal operation. This conclusion is based on the following assumptions and conditions stated by the COE:

a. The prevailing summer current patterns at the disposal site will maintain a general shoreward drift, keeping the surface plume and area of suspended bottom sediments moving away from Stellwagen Bank.

b. The top of Stellwagen Bank (ca 100' deep) is separated from the disposal site (ca 300' deep) by a strong thermocline (T 13.5°C) during the summer.

c. Stellwagen Bank is a high-energy area upon which fine silts and clay do not accumulate.

d. The dredged material is similar to the existing disposal site sediments both physically and chemically.

e. Sediments dredged by clamshell maintain a relatively cohesive mass when dumped so that 99% of the material reaches the bottom.

f. Use of a taut wire buoy system will provide for more accurate disposal and should maximize the effectiveness of the capping efforts.

g. The known life history of the sand lance indicates they do not utilize the Stellwagen Basin, and studies on the distribution (CETAP, 1981) and behavior (Weinrich, 1982) of humpback whales indicate that they utilize the waters of Stellwagen Bank and deep waters to the north and east of the Bank during the summer.

6. Studies can be designed to monitor conditions at the disposal site to allow detection of changes that may occur during the project life.

In summary, the proposed disposal of 720,000 cy of dredged material (on top of an additional 166,000 cy from other projects) at the Foul Area interim ocean disposal site is not likely to jeopardize the continued existence of the baleen whales that use the Stellwagen Bank or other endangered or threatened sea turtle species that are found in the area. However, oceanographic conditions at the disposal site may vary during the summer and fall so that the Bank may be more affected than stated in the Biological Assessment. Furthermore, little is known about either the background levels of chemical contaminants in sand lance or the levels that may severely affect them. It has been the opinion of the NMFS that the Stellwagen Bank food chain involving baleen whales, and their present focus on a single prey species, is vulnerable to environmental pressures. In particular, the depleted North Atlantic humpback whale stock has shown a marked feeding preference for sand lance during the summer. We believe that any sharp decline in sand lance numbers, as has occurred with many other forage species around the world (Pacific sardines, Peruvian anchovetta, South African pilchard, etc.), is likely to cause dispersal of a major portion of the North Atlantic stock of humpback whales (estimated 600 out of 2,000 total population) from a preferred area. Dispersal or displacement of a depleted species such as the humpback whale from a preferred area such as Stellwagen Bank is likely, at a minimum, to increase the effort necessary for individuals to feed. Dispersal of groups may also reduce the social interactions between individuals and decrease the benefits the species may gain from these groups. These adverse affects are likely to jeopardize the continued existence of a species such as the humpback, whose reproductive rates are believed to be barely maintaining their numbers at present levels.

We believe that the dredging and disposal operation, as presently planned, are not likely to affect adversely the humpback whale or sand lance. However, we foresee the possibility that certain unexpected events may occur during the project period that may change the basis for this decision. Therefore, we expect the COE to monitor the disposal activity through the DAMOS program and other studies, as are discussed in the following recommendation Section.

RECOMMENDATIONS:

As stated in the POTENTIAL IMPACTS TO SPECIES section of this opinion, we are concerned that the proposed disposal at the Foul Area, which will encompass several months, may override the conditions mentioned in the Biological Assessment upon which we have based this opinion. For example, there are several smaller dredging projects, not covered by this opinion, that are to be dumped prior to the proposed disposal of Boston Harbor material. The chemical analysis of these sediments were not provided in the Biological Assessment, however, the material is to be "capped" by the Boston Harbor material. These additional projects may total 166,000 cy and will undoubtedly extend the period of continuous dumping at the disposal site. We are concerned that the continuous long-term dumping will allow a persistent plume to develop that may affect areas of Stellwagen Bank. Furthermore, the continuous dumping activity will not allow the active disposed sediment mound to stabilize. This may lead to extended suspension of disposed material at the bottom, and subsequent release of contaminants into the water column. Therefore, we recommend that the COE undertake adequate monitoring of the dumping activities from the Foul Area to Stellwagen Bank. Monitoring should be designed to determine if the dredged material remains contained at the Foul Area site throughout the proposed project period as stated in the Biological Assessment.

We are aware that the COE is working closely with the NMFS Northeast Region and Northeast Center personnel to develop and conduct an adequate monitoring program. We emphasize that the NMFS is concerned that monitoring studies be conducted at least at the midpoint as well as at the end of the project. The Northeast Monitoring Program at the Northeast Fisheries Center is undertaking studies that will be of assistance in this matter. The NMFS believes it is essential to adequately monitor the conditions upon which this Biological Opinion was based.

REINITIATION:

Consultation should be reinitiated: (1) if new information reveals impacts of the identified activity or program that may affect listed species or their habitats; (2) if the proposed activities are modified; or (3) if a new species is listed that may be affected by the proposed activity or program.

Nothing in this Biological Opinion should be construed as authorizing any takings (as defined in Section 3 of the ESA) of endangered or threatened species pursuant to Section 10(a) nor immunizing any actions from the prohibitions of Section 9(a) of the ESA.

LITERATURE CITED

University of Rhode Island (URI). 1981. A Characterization of Marine Mammals and Turtles in the Mid- and North-Atlantic Areas of the U. S. Outer Continental Shelf. Annual Report for 1979 to the Bureau of Land Management under Contract No. AA551-CT8-48. April 1981. 839 pp.

Weinrich, Mason T. 1982. Biology of the Humpback Whale (Megaptera novaeangliae): Northern Stellwagen Bank, Summer, 1981. Cetacean Research Unit Special Report No. 1. July 1982. 50 pp.

December 1, 1982

Navigation Branch, Operations Division Otis/jr/322

MJO

Mr. William G. Gordon
Administrator
National Marine Fisheries Service
Washington, DC 20230

Dear Mr. Gordon:

This letter concerns the ongoing maintenance dredging of the Federal navigation project in Boston Harbor, Massachusetts. My reason for writing concerns a proposal from our contractor to use a hopper dredge in the President Roads Anchorage. The use of this type of equipment was not discussed in the previous documents prepared for this project.

The conclusion in your Section 7 Biological Opinion that the project would not jeopardize the existence of the endangered and threatened species in Massachusetts Bay was based in part on our use of a clamshell dredge which maintains the cohesive mass of the material during disposal and minimizes the amount of mixing and suspension that occurs as the material descends. The use of a hopper dredge would change both the dredging and disposal operation and may increase the amount of material that is initially suspended when the vessel is dumped. We have not studied disposal under these conditions however, and see this proposal as an opportunity to obtain some useful information and possibly improve the current operation without impacting on endangered species. Attachment 1 gives additional information on the operation of a hopper dredge.

First let me summarize what has taken place so far. We have completed dredging in the Mystic and Chelsea Rivers with approximately 400,000 cubic yards of material being dumped at the site. Our monitoring has shown that a well defined mound has not formed and material has spread over a wider area than originally projected. We attribute this to the rough sea conditions at the site and their impact on the contractor's operation. Approximately 460,000 cubic yards of material remains to be removed from PresidentsRoads Anchorage. With weather conditions deteriorating over the next several months we do not anticipate any improvement in the disposal operation.

We believe that the hopper dredge offers the following advantages over the present operation.

1. The vessel is considerably more maneuverable than a tugboat towing a scow and will have the ability to point dump in rough sea conditions with greater accuracy.

2. This vessel has a higher production rate than the equipment currently being used. The timeframe to complete the work should be reduced by up to a month.

The contractor has agreed to conduct a monitoring program in addition to the work we are performing. The purpose of the program is to determine the physical properties of the sediment to be dredged, evaluate the changes that occur in those properties during the dredging and disposal operation and observe how the sediment behaves during and after disposal of the Foul Area. It will involve the following activities:

1. Collecting and analyzing sediment samples from the dredge site.

2. Collecting and analyzing sediment and water samples from within the hopper dredge both at the dredge and disposal sites.

3. Measurement of turbidity levels at the dredge site.

4. Measurement of turbidity levels, dispersion and advection of the plume generated by the disposal operation.

5. Bathymetric survey and sediment sampling to determine the distribution and physical properties of the disposal sediment and to evaluate its stability.

These tasks will be performed immediately after the completion of dredging and six months later. Concurrently, we will also be observing the balance of remaining bucket and scow disposal in the area.

In summary, the contractor's willingness to perform a monitoring program to advance the use of a hopper dredge gives us the opportunity to obtain some useful information which can be used on future projects. This method may also improve the performance at this project. There should be no impact on endangered or threatened species since the work will be performed in December and January when they are not in the area.

I would appreciate receiving your comments on this proposal by 15 December. Please contact me at (617) 647-8225 if there are any questions.

Sincerely,

~~CH~~/NAV. E

ACTG. ~~CHIEF~~ERS DIV.

SPECIAL ~~ASSISTANT~~

DEP ~~DIV~~. ENG.

Attachment

A. N. Rappaport
LTC, Corps of Engineers
Deputy Division Engineer

CC: Mr. Douglas Beach
National Marine Fisheries Service
7 Pleasant St.
Gloucester, MA 01930

Mr. Charles Karnella F/MM2
National Marine Fisheries Service
Washington, DC 20230

✓Nav. Br. File

SELF-PROPELLED HOPPER DREDGE

This type of dredge has the molded hull and lines of an ocean vessel. The bottom material is raised by dredge pumps through a pipe system which extends over the side of the vessel. This pipe system can be raised and lowered by hoisting tackle and winches. The lower end of this system is equipped with a draghead which makes contact with the bottom material. The pumps lift the mixture to the surface where it is discharged into hoppers. It is made up of four parts water to one part solids. As pumping continues, the solid particles settle in the hoppers while the excess water passes overboard through overflow troughs. The vessel empties the loaded hoppers through doors which open in the bottom of the vessel.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Center
Sandy Hook Laboratory
Highlands, New Jersey 07732

December 6, 1982 F/NEC4:JBP

TO: Distribution

FROM: John B. Pearce, Chief, Division of Environmental Assessment

SUBJECT: Analyses of Sand Lance Samples from Vicinity of Stellwagen Bank

Earlier this summer we had discussions in Woods Hole which related to the collection of a series of samples of sand lance from the vicinity of Stellwagen Banks The samples collected previously have been worked up and a report has been written. I can tell you at the moment that there was little evidence to suggest extensive contamination of the sand lance by a number of organic contaminants. During a recent Ocean Pulse cruise we resampled this area and I am assuming that appropriate samples have been collected and processed (following proper quality assurance procedures). These samples will be forwarded to our Gloucester Laboratory or to a contractor for analyses for PCB's, PAH's, etc.

As soon as we determine the body burdens of these contaminants we will make a requisite comparison and will prepare a report for interagency use in regard to any possible effects of dredged material disposal in the vicinity of Stillwagen Bank.

If you have any immediate questions or comments, please feel free to contact me.

Distribution:
D. Beach
R. Rehfus
C. Hard
D. Semonian

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

DEC 17 1982 F/M412:PC
F/NER54:DB

Colonel Carl B. Sciple
New England Division
Corps of Engineers
Department of the Army
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Colonel Sciple:

This in response to Lt. Colonel Rappaport's letter of December 1, 1982, notifying us of a proposal by your contractor to use a hopper dredge on the remainder of the dredge and disposal operation in the President Roads Anchorage of Boston Harbor. The letter requested our comments on how this change in dredge and disposal methods may affect the Biological Opinion issued by the National Marine Fisheries Service (NMFS) on October 6, 1982, pursuant to Section 7 of the Endangered Species Act of 1973, as amended. As stated in the letter, the use of a hopper dredge was not discussed in either the Biological Assessment provided by the New England Division of the Corps of Engineers (COE) on March 16, 1982, or the resultant NMFS Biological Opinion. Lt. Colonel Rappaport's letter described the existing conditions at the disposal site that support the use of a hopper dredge to finish the project during this winter season.

The NMFS Biological Opinion issued on October 6, 1982, concluded no jeopardy based on the following line of reasoning regarding the method of dredging and disposal to be employed in this project. Clamshell or bucket dredging was held to be superior to other methods because the sediments, when disposed, would maintain a relatively cohesive mass as they descended to the bottom. This was believed to reduce the potential for suspended sediment plumes reaching the top of Stellwagen Bank during the period of residency by humpback whales. This disposal technique, combined with the use of a taut wire buoy, was also believed to increase the accuracy of the disposal at the depths found at the dumpsite (ca. 300'), so that capping could be achieved. Although capping at this depth had not been attempted before, this project was designed to determine its practical use at this site. Materials from this project were said to be suitable to attempt this technique at the deeper disposal site adjacent to Stellwagen Bank. The remaining President Roads material was to be used as the cap on this project.

The major concerns of the NMFS on this project were the effects of long-term dumping on humpback whales and the Stellwagen Bank food web that supports them. Therefore, we recommended that studies and monitoring be carried out that could determine if the fate of the disposed material and formation of a mound took place as proposed.

The monitoring studies done to date indicate that a definitive mound has not formed with the 400,000 cubic yards disposed from the Chelsea and Mystic Rivers. The material has spread out more than expected, although there is no

DEC 20 1982

indication that material has moved toward Stellwagen Bank. Changing to the hopper dredge method without an adequately redesigned study program may not answer the question of which method is best suited for this deep water dumpsite. The reasons for the lack of mound formation at the site have not been adequately investigated. Monitoring studies such as proposed by the contractor may be designed to study this problem. A comparison study of dredge and disposal methods should involve at least the five study elements to be undertaken by the contractor. Furthermore, to insure that the results of these studies can be measured, substantial volumes of dredged material for both the hopper and bucket operations should be monitored.

Lt. Colonel Rappaport has stated that by allowing the project to be completed before the whales return in the spring of 1983, several advantages may be gained from changing to hopper dredging that will be of benefit to the humpback whales on Stellwagen Bank. A hopper dredge will be able to finish the President Roads Anchorage more quickly than bucket dredging and tug and scow disposal. Hopper dredges can transport more material per load and can operate safely in heavier seas. This would allow more continuous operation during the winter months. Presumably the hopper dredge is more maneuverable in rough seas.

We realize that the hopper dredge may increase the amount of material that is initially suspended during disposal. However, the humpback whales have left the area and should not return until April or May 1983. Oceanographic conditions during winter and early spring will scour the area of contaminated sediments, therefore, we do not believe that a temporary increase in suspended material during winter disposal will adversely affect the humpback whales. Furthermore, additional monitoring studies by the contractor immediately following completion of the project and six months later will add to the ongoing studies by the COE and complement the NMFS studies on sand lance and other biota of that area.

We agree that changing from a bucket and scow operation to a hopper dredge and disposal operation will not change the conclusion stated in our Biological Opinion of October 6, 1982, provided that disposal is concluded and materials are settled before the return of the whales. We believe it important that the monitoring program recommended in our Biological Opinion be continued, and that any additional studies be designed so that the results are comparable. We expect that the information collected during this project will be important in assessing the potential effects of future disposal operations at the "Foul Area" ocean disposal site on the whales on Stellwagen Bank.

Sincerely yours,

for Roland F. Smith

William G. Gordon
Assistant Administrator
for Fisheries

December 15, 1983

Sullivan/je/351

Navigation Branch, Operations Division

Mr. William A. Brutsch, P.E.
Director and Chief Engineer
Water Division, Metropolitan District Commission
20 Somerset Street
Boston, MA 02114

Dear Mr. Brutsch:

This is in connection with our letter of November 2, 1983 and previous correspondence concerning partial removal of the abandoned MDC water tunnel in conjunction with the scheduled 1984 maintenance dredging of the Chelsea River Federal channel.

Your January 1914 record drawing of the abandoned water tunnel shows the top of the tunnel at an elevation of 35.50 feet below Mean Low Water (MLW) and the bottom at 45.66 feet below MLW. The 36 inch cast iron pipe is encased by poured concrete, brickwork and plating. A number of active utility lines ranging in approximate elevations from 40 to 50 feet below MLW exist in the immediate area of the abandoned water tunnel. After reviewing the above information, we have reconsidered the advisability of removing a segment of the water pipe and tunnel to accomodate maintenance of the channel. We believe the project depth of 35 feet below MLW can be obtained by working with a clamshell dredge in close proximity to the water tunnel. This will probably result in portions of the water tunnel casing being damaged or removed incidental to dredging operations. Please let me know if this would pose any problems for you.

Mr. Daniel Sullivan may by contacted by letter or telephone if you have any questions. His telephone number is 647-8351.

Sincerely,

CH. NAV. BR.

C.G. Boutilier
Chief, Navigation Branch

Copy Furnished:

Mr. ~~James Ollis~~ Gregory Fulgione
Water Division
Metropolitan District Commission
20 Somerset St.
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Northeast Petroleum Corp.
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ATTN: Mr. David Monga

Revere Terminal Corp.
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ATTN: Mr. Ronald Kenney

Belcher New England, Inc.
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B.P. Oil Co.
41 Lee Burbank Highway
Revere, MA 02151
ATTN: Mr. David Merch

Mr. ~~[illegible]~~ Ralph R. DePari
Boston Edison
800 Boylston St.
Boston, MA ~~w/encl.~~

~~Chief, Engr. Div. [illegible]~~
Nav. Br. File
Chief, Coastal Engr. & Survey Unit
Office of Counsel

Mr. David F. Reilly
Boston Gas Company
201 Rivermore Street
Boston, MA 02132

Mr. Thomas Flaherty
Cable Division, M.B.T.A.
500 Arborway
~~Jamica~~ Jamaica Plain, MA 02130
~~Chief, Coastal Engr. & Survey Unit~~
~~Nav. Br. File~~

January 10, 1984 sullivan/351

Navigation Branch, Operations Division

Ms. Ruth Rahfus
National Marine Fisheries Service
Habitat Protection Branch
7 Pleasant Street
Gloucester, MA 01930

Dear Ms. Rahfus:

We are developing a proposal to perform minor maintenance dredging in the vicinity of the Chelsea Street Bridge in the 35-Foot Federal navigation channel in the Chelsea River, Boston Harbor.

During our 1983 maintenance dredging of this project we refrained from dredging a 400 feet-long reach in the vicinity of the Chelsea Street Bridge in order to avoid damaging a Boston Edison submarine cable and the M.D.C. water tunnel which cross the channel in this area. The Boston Edison submarine cable has been removed and we have been advised that the M.D.C. water tunnel has been abandoned. Our inability to maintain the above-referenced reach to the authorized depth of 35 feet at Mean Low Water has resulted in continuous tidal delays and economic hardships for the five oil companies located upstream of the Chelsea Street Bridge. The controlling depth in this reach is presently 28.7 feet at Mean Low Water.

The proposed work involves removing approximately 8,000 cubic yards of material which will be excavated by a clamshell dredge, transported by scow to the Boston Foul Area and point dumped at a buoy. Enclosed is a survey drawing showing the proposed dredging area along with the results of bulk sediment, elutriate and bioassay/bioaccumulation testing for the dredging area. The Environmental Assessment prepared in December, 1981 for the recently completed maintenance dredging in the Chelsea River will be updated to reflect the proposed work.

The work is scheduled to take place in July and August of 1984. A public notice will be issued shortly. I would appreciate receiving any comments you may have by February 29, 1984. Should you have any questions, please contact Mr. Daniel Sullivan of my staff at (617) [illegible].

Sincerely,

V.L. Andreliunas
Chief, Operations Division

Mr. Walter Newman
EPA Region I
Environmental Evaluation Section
JFK Federal Building
Boston, MA 02203

Mr. Gordon E. Beckett
U.S. Fish and Wildlife Ser.
Division of Ecological Serv.
P.O. Box 1518
Concord, NH 03301

d. SULLIVAN
ACTG. CH. NAV.
OPS. DIV.

January 31, 1984

Operations Division, Navigation Branch

Mr. Thomas McMahon
Massachusetts Department of Environmental
Quality Engineering
Division of Water Pollution Control
1 Winter Street
Boston, Massachusetts 02108

Dear Mr. McMahon:

This letter concerns minor maintenance dredging of the Chelsea R[illegible] Federal Navigation Channel located in Boston Harbor.

An application for Water Quality Certification for this maintenance dredging is enclosed. Please contact Mr. Daniel Sullivan at [illegible] if you have any questions.

Sincerely,

BOUTILIER

ANDRELIUNAS

V. L. Andreliunas
Chief, Operations [illegible]

Enclosure
As stated

CF: Opers Div File-Nav. Br.

MASSACHUSETTS DIVISION OF WATER POLLUTION CONTROL

Application for Certification for Dredging, Dredged Material Disposal and Filling Projects

PART I - Standard Application:

1. Name and Address of Applicant:

U. S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254
Telephone: (617) 647-8330

2. a. Description of Proposed Dredging Site:

The existing Federal Navigation project in the Chelsea River provides for a channel 35 feet deep at Mean Low Water, generally 225 to 250 feet wide below the Chelsea Street Bridge and 250 to 430 feet wide above the bridge with a turning and maneuvering basin 800 by 1,000 feet in area and 35 feet deep at Mean Low Water at the upstream limit of the project. The project is mainly used by commercial vessels engaged in the delivery of liquid petroleum products to the oil terminals located on the Chelsea River. During 1985 maintenance dredging of the project, dredging was not performed in a 400 foot long reach in the vicinity of the Chelsea Street Bridge in order to avoid damaging a Boston Edison submarine cable and the M.D.C. water tunnel which crosses the channel in this area. The Boston Edison submarine cable has been removed and the M.D.C. water tunnel has been abandoned. The inability to maintain the above referenced reach to the authorized depth of 35 feet at Mean Low Water has resulted in continued tidal delays and economic hardships for the five oil companies located upstream of the Chelsea Street Bridge. The controlling depth in this reach is presently 28.7 feet at Mean Low Water. Water quality in the Chelsea River is classified as SC.

The proposed work involves removing approximately 8,000 cubic yards of material which will be excavated by a clamshell dredge, transported by scow to the Boston Foul Area, and point dumped at a buoy.

b. Project Plans:

Figure 1 - Drawing No. 285, Sheet 2 of 3 showing area to be dredged and sample locations

Figure 4 - Chartlet showing disposal area

c. Physical Description:

1. Dredging Area - Length - 530 feet; Width - 80 to 200 feet, Depth - 35 feet at Mean Low Water, Volume - 8,000 cubic yards

2. Maintenance Dredging

3. The work will be done by a private contractor. A clamshell dredge will remove the material and transport it by scow to the Boston Foul Area for point dumping at a buoy

4. Historical Parameters:

1. We have no information on oil or chemical spills at the project site

2. The existing Federal channel in Chelsea River was constructed in 1939. The channel was deepened in 1965 to 35 feet at Mean Low Water; at that time approximately 669,500 cubic yards of ordinary material were removed. Maintenance dredging was performed in 1983, when 126,000 cubic yards of ordinary material were removed.

Description of Materials to be Dredged:

a. Chemical Analysis of Sediment

Enclosed are the results of bulk sediment, elutriate and bioassay/bioaccumulation testing for the dredging area. Refer to Figure 1 for sample locations

b. Grain Size Analysis

N/A

4. Description of the Disposal Site for Dredged Material

The Boston Foul Area is an EPA approved interim site and is a circular area with a diameter of 2 nautical miles and center at 42 25.7 N; 70 34.0 W. Refer to Figure 2 for chartlet.

Application is hereby made for Water Quality Certification concerning the activities described herein. I certify that I am familiar with the information contained in this application and that to the best of my knowledge and belief such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.

C.G. BOUTILIER

SIGNATURE OF APPLICANT

DATE

TELEPHONE OR VERBAL CONVERSATION RECORD For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.	DATE 9 January 1989

SUBJECT OF CONVERSATION

Need for consistency determination for maintenance dredging of Chelsea River

INCOMING CALL

PERSON CALLING	ADDRESS	PHONE NUMBER AND EXTENSION
PERSON CALLED	**OFFICE**	**PHONE NUMBER AND EXTENSION**

OUTGOING CALL

PERSON CALLING	OFFICE	PHONE NUMBER AND EXTENSION
Dan Sullivan		
PERSON CALLED	**ADDRESS**	**PHONE NUMBER AND EXTENSION**
Harriet Diamond	Mass. C.Z.M	727 C.Z.M

SUMMARY OF CONVERSATION

I called Ms. Diamond to inquire if we needed a consistency determination for the proposed maintenance dredging of the Chelsea River as the volume of material to be removed is under 10,000 cubic yards. Ms. Diamond informed me that since the volume of material to be removed was under 10,000 cubic yards we did not need a consistency determination for the proposed work in the Chelsea River as the volume of material to be removed is approximately 8,000 cubic yards.

DA FORM 1 APR 66 751 REPLACES EDITION OF 1 FEB 58 WHICH WILL BE USED.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

February 7, 1984

REPLY TO
ATTENTION OF

Navigation Branch, Operations Division

PUBLIC NOTICE

MAINTENANCE DREDGING OF CHELSEA RIVER FEDERAL NAVIGATION CHANNEL, BOSTON HARBOR, MASSACHUSETTS

The U. S. Army Corps of Engineers, New England Division, plans to perform minor maintenance in the Chelsea River Federal Navigation project under the provisions of Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (P.L. 92-532) and Section 404 of the Clean Water Act (P.L. 92-500) and to authorize such work in accordance with Regulation 33 CFR 209.145. Attachment 1 lists pertinent laws, regulations and directives.

Character and Purpose of Work: During 1983 maintenance dredging of the Chelsea River work in a 400 foot long reach in the vicinity of the Chelsea Street Bridge was deferred in order to avoid damage to a Boston Edison submarine cable and the Metropolitan District Commission (MDC) water tunnel which crosses the channel in this area. The Boston Edison submarine cable has been removed and the MDC water tunnel has been abandoned. Lack of maintenance in the above-referenced reach to the authorized depth of 35 feet at mean low water has resulted in continuous tidal delays and economic hardships for the five oil companies located upstream of the Chelsea Street Bridge. The controlling depth in the reach is 28.7 feet at mean low water.

The work proposed to be performed in July 1984 would provide a 35 ft deep channel and involves removing approximately 8,000 cubic yards of material which will be excavated by a clamshell dredge, transported by scow to the Boston Foul Area and point dumped at a buoy. Attachments 2 and 3 show the proposed dredging and disposal areas, respectively.

Additional Information: Additional information may be obtained from Mr. Daniel Sullivan, Navigation Branch, at the above address, telephone number (617) 647-8351. Collect calls will be accepted weekdays between 9:00 a.m. and 3:00 p.m.

Coordination: The proposed work is being coordinated with the following Federal and State agencies:

Federal

Environmental Protection Agency
National Marine Fisheries Agency
Fish and Wildlife Service

State of Massachusetts

Department of Environmental Quality Engineering
Office of Coastal Zone Management
Division of Water Pollution Control

*U.S. GPO: 1981-602-122

Environmental Impacts: An Environmental Assessment for maintenance dredging in Boston Harbor was prepared and coordinated with appropriate agencies in 1981. The Chelsea River portion of this assessment will be updated to reflect the proposed work. Copies of this document are on file at New England Division Headquarters.

The Division Engineer has made a preliminary determination that an Environmental Impact Statement for the proposed Chelsea River dredging is not required under the provisions of the National Environmental Policy Act of 1969. That determination will be reviewed in light of facts submitted in response to this Notice.

Federal Consistency with State's Coastal Zone Management Program: The New England Division finds that maintenance dredging in the authorized navigation project is consistent with the applicable management program established as a result of the Coastal Zone Management Act of 1972. The dredging operation will be conducted, to the maximum extent practicable, in a manner that is consistent with the approved management program.

Other Information

a. Endangered Species: Preliminary determinations indicated that the proposed activity would not affect an endangered species or designated critical habitat of endangered or threatened species pursuant to the Endangered Species Act of 1973 (87 Stat. 844).

b. Cultural Resources: The proposed work involves maintenance of previously dredged areas and would not affect any cultural or archaelogical features.

c. Other Dredging Activity: The Boston Cove Marina has applied for a permit to construct a bulkhead adjacent to its property and to place about 25,000 cubic yards of dredged material behind the bulkhead. Gibbs Oil Co. has applied for a permit to dredge about 13,500 cubic yards of material from its facility and dispose of this material at the Foul Area. Amerada Hess has declared their intent to file an application for dredging in the Chelsea River. Sampling and testing of the material involved in these proposals is underway.

d. Floodplain Management: In accordance with Executive Order 11988, the Corps of Engineers has determined that the proposed work would not contribute to negative impacts or damages caused by floods.

e. Alternatives: The only alternative to maintenance dredging of the channel is to forego dredging and accept the economic losses which would accompany such a decision.

There are no suitable inland disposal areas in the vicinity of the work. Other options, such as marsh creation, are impractical due to the small amount of material involved. The Foul Area is the nearest approved open water disposal site.

Environmental Impacts: An Environmental Assessment for maintenance dredging in Boston Harbor was prepared and coordinated with appropriate agencies in 1981. The Chelsea River portion of this assessment will be updated to reflect the proposed work. Copies of this document are on file at New England Division Headquarters.

The Division Engineer has made a preliminary determination that an Environmental Impact Statement for the proposed Chelsea River dredging is not required under the provisions of the National Environmental Policy Act of 1969. That determination will be reviewed in light of facts submitted in response to this Notice.

Federal Consistency with State's Coastal Zone Management Program: The New England Division finds that maintenance dredging in the authorized navigation project is consistent with the applicable management program established as a result of the Coastal Zone Management Act of 1972. The dredging operation will be conducted, to the maximum extent practicable, in a manner that is consistent with the approved management program.

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e. Alternatives: The only alternative to maintenance dredging of the channel is to forego dredging and accept the economic losses which would accompany such a decision.

There are no suitable inland disposal areas in the vicinity of the work. Other options, such as marsh creation, are impractical due to the small amount of material involved. The Foul Area is the nearest approved open water disposal site.

f. <u>Additional Requirements</u>: The proposed work will not be performed until certification has been received from the Massachusetts Department of Environmental Quality Engineering as required under Section 401 of the Clean Water Act of 1977. (P.L. 95-217). The Clean Water Act of 1977 requires that the work comply with state or interstate requirements to control the discharge of dredged or fill material. These state requirements must be met where applicable before any work riverward of the ordinary high water line or adjacent to wetlands may be accomplished. The above requirements shall not be construed as affecting or impairing the authority of the Secretary of the Army to maintain navigation.

The decision whether to perform the work will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits which reasonably may be expected to accrue from the proposal will be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered; among those are conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use classification, and the welfare of the people.

Selection of the above described proposed disposal site for dredged material associated with maintenance of the referenced navigation project shall be made through the application of guidelines promulgated by the Administrator, U. S. Environmental Protection Agency, in conjunction with the Secretary of the Army. If these guidelines alone prohibit the use of this proposed disposal site, any potential impairment to the maintenance of navigation, including any economic impact on navigation which would result from failure to use this disposal site, will also be considered.

The disposal of this dredged material in ocean waters will be evaluated to determine that the proposed disposal will not unreasonably degrade or endanger human health, welfare or amenities or the marine environment, ecological system or economic potentialities. In making this determination, the criteria established by the Administrator, U. S. Environmental Protection Agency, pursuant to Section 102(a) of Marine Protection, Research and Sanctuaries Act of 1972 shall be applied. In addition, based upon an evaluation of the potential effect which the failure to utilize this ocean disposal site will have on navigation, economic and industrial development, and foreign and domestic commerce of the United States, an independent determination will also be made of the need to dispose of this dredged material in ocean waters, or other possible methods of disposal, and appropriate location of the disposal.

Any person who has an interest which may be affected by the disposal of this dredged material may request a public hearing. The request must be submitted in writing to the Division Engineer within 30 days of the date of this notice and must clearly set forth the interest which may be affected and the manner in which the interest may be affected by this activity.

Please bring this notice to the attention of anyone you know to be interested in this project. Comments are invited from all interested parties and should be directed to the Division Engineer, 424 Trapelo Road, Waltham, MA 02254, ATTN: Navigation Branch, within 30 days of this notice.

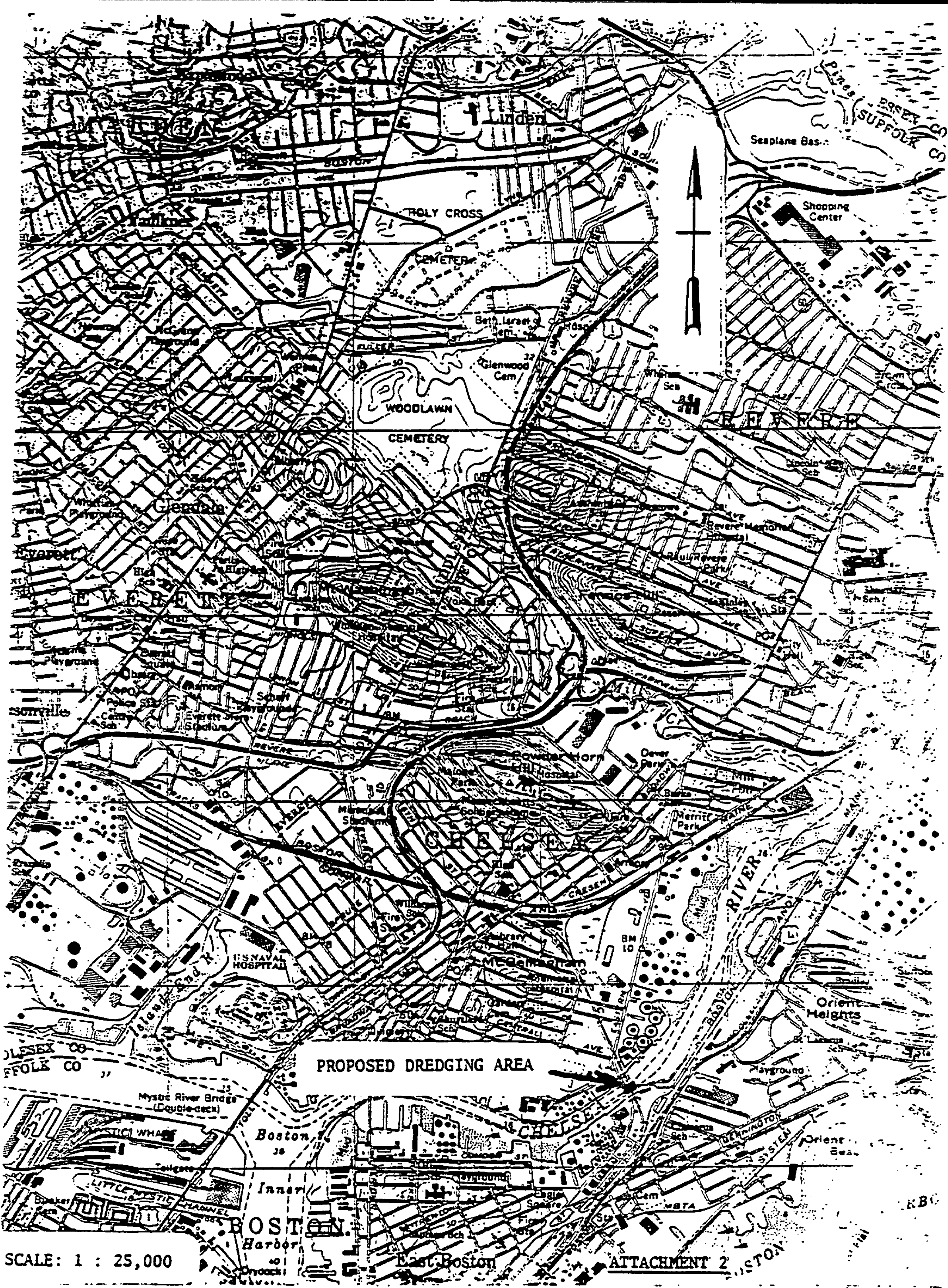
CARL B. SCIPLE
Colonel, Corps of Engineers
Division Engineer

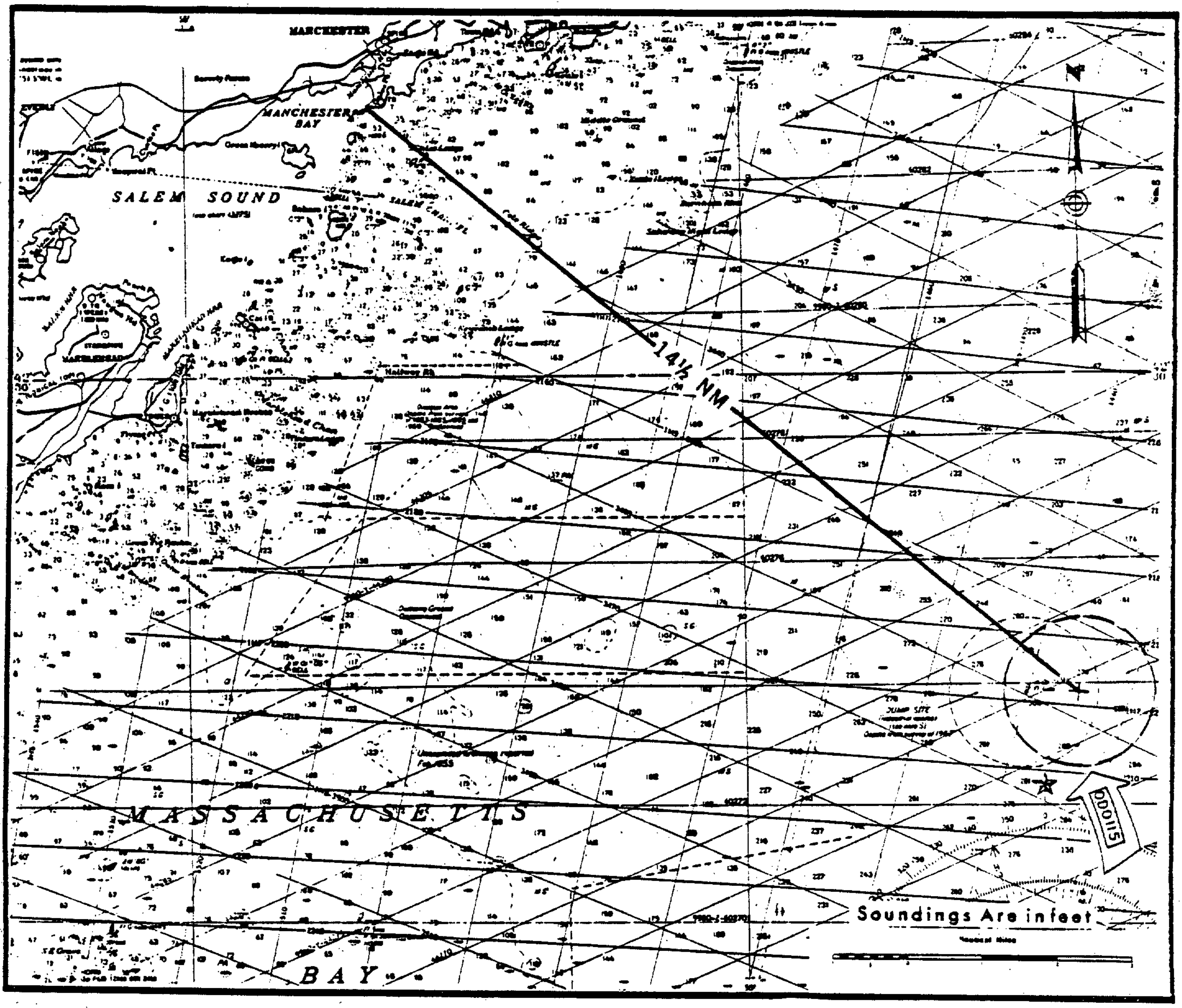
E-68a

PERTINENT LAWS, REGULATIONS AND DIRECTIVES

The proposed activity is to be reviewed in accordance with the following Federal laws, regulations, and directives as applicable:

Sections 401 and 404, of the Clean Water Act of 1977 (P.L. 95-217)
Section 103, Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413)
National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347)
Fish and Wildlife Coordination Act (16 U.S.C. 661-666c)
Fish and Wildlife Act of 1956 (16 U.S.C. 472a, et. seq.)
Migratory Marine Game - Fish Act (16 U.S.C. 760c-760g)
Sections 307(c) (1) and (2), Coastal Zone Management Act of 1972 (16 U.S.C. 1456(c) (1) and (2))
National Historic Preservation Act of 1966 (16 U.S.C. 470)
Endangered Species Act of 1973 (16 U.S.C. 668aa-688cc)
33 C.F.R. 209.145, "Federal Project Involving the Disposal of Dredged Material in Navigable and Ocean Waters"
40 C.F.R. 230, "Discharge of Dredged or Fill Material"
40 C.F.R. 220-229, "Ocean Dumping"


Linden
Seaplane Basin
ESSEX CO
SUFFOLK CO
Shopping Center
HOLY CROSS
CEMETERY
Beth Israel Cem
Glenwood Cem
WOODLAWN
CEMETERY
REVERE
Revere Memorial Hospital
Paul Revere Park
Glendale
Everett
EVERETT
Everett Stadium
Powder Horn Hill
Hospital
CHELSEA
Merritt Park
Dever Park
Mill Hill
RIVER
U.S.NAVAL HOSPITAL
Orient Heights
Playground
Orient
MIDDLESEX CO
SUFFOLK CO
PROPOSED DREDGING AREA
Mystic River Bridge (Double deck)
MYSTIC WHARF
LITTLE MYSTIC CHANNEL
Boston
Inner
BOSTON
Harbor
Drydock
East Boston
Eagle Square
MBTA
SCALE: 1 : 25,000
ATTACHMENT 2



EPA OD0115: **FOUL AREA** N.O.S. CHART: 13267

DEPTH RANGE: 159 TO 304 FT. MLW DATE: 20 DECEMBER 1980

CENTER COORDINATES: 42°-25.7'N, 70°-34.0'W

DESCRIPTION: THIS SITE IS A CIRCULAR AREA WITH A DIAMETER OF 2 NAUTICAL MILES AND CENTER AT 42°-25.7'N, 70°-34.0'W IN THE VICINITY OF THE HISTORIC FOUL AREA FROM THE CENTER, THE MARBLEHEAD TOWER BEARS TRUE 282° AT 24,300 YARDS AND BAKERS ISLAND HORN BEARS TRUE 300° AT 24,300 YARDS.

ATTACHMENT 3

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Water Pollution Control
One Winter Street, Boston 02108

ANTHONY D. CORTESE, Sc. D.
Commissioner

February 8, 1984

C.E. Boutilier
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02154

Re: Water Quality Certification
Dredge
Chelsea River
Boston

Dear Mr. Boutilier:

In response to your request dated January 31, 1984, this Division has reviewed your application for a water quality certification for proposed maintenance dredging of a 530' reach of the Chelsea River downstream of the Chelsea Street bridge. Due to the presence of a submarine cable and water pipe, this section of the river was not dredged in 1983 when the rest of the Chelsea River Channel was dredged. The electric cable has been removed and the water pipe abandoned. Approximately 8000 cubic yards of fine sediment will be removed by clamshell dredge and transported to the Foul Area.

In accordance with the provisions of Section 401 of the Federal Water Pollution Control Act as amended (Public Law 95-217), this Division issues the following Water Quality Certification relative to this project, subject to the following condition:

1. The dredging portion of the project could result in a violation of water quality standards adopted by this Division. Therefore, reasonable care and diligence shall be taken by the contractor to assure that the proposed activity will be conducted in a manner which will minimize violations of said standards.

Should any violation of the water quality standards or the terms of this certification occur as a result of the proposed activity, the Division will direct that the condition be corrected. Non-compliance on the part of the permittee will be cause for this Division to recommend the revocation of the permit(s) issued therefor or to take such other action as is authorized by the General Laws of the Commonwealth. This certification does not relieve the applicant of the duty to comply with any other statutes and regulations.

Very truly yours,

Thomas C. McMahon

Thomas C. McMahon
Director

TCM/JP/wp

cc: Anthony D. Cortese, Sc.D., Commissioner, Department of Environmental Quality Engineering, One Winter Street, Boston, MA 02108
William Lawless, Chief, Permits Branch, Corps of Engineers, 424 Trapelo Road, Waltham, MA 02154
John Zajac, Licenses & Permits, Division of Wetlands and Waterways Regulation DEQE, One Winter Street, Boston, MA 02108
Philip Coates, Director, Division of Marine Fisheries, 100 Cambridge Street, Boston, MA 02202
Harriet Diamond, Coastal Zone Management, 100 Cambridge Street, Boston, MA 02202
Douglas Thompson, Permits Section, EPA Region I, John F. Kennedy Building, Boston, MA 02203

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

February 27, 1984

Vyto L. Andreliunas
Chief, Operations Division
Navigation Branch
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, MA 02254

Dear Mr. Andreliunas,

We have no objection to your proposal to perform minor maintenance dredging in the vicinity of the Chelsea Street Bridge in the 35-foot Federal navigation channel in the Chelsea River, Boston Harbor.

Previous testing results indicate that the proposed disposal of approximately 8,000 cubic yards of material at the Boston Foul Area, complies with the provisions of the Ocean Dumping Act. If any further coordination is required please call Edward Reiner of my staff at 223-3911.

Sincerely,

William J Butler

William J. Butler
Chief, Planning and Standards Section

cc: USFWS, Concord, NH
NMFS, Gloucester, MA

TELEPHONE OR VERBAL CONVERSATION RECORD

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

SUBJECT OF CONVERSATION	DATE
Maintenance Dredging Chelsea River	[illegible]. March 1980

INCOMING CALL

PERSON CALLING	ADDRESS	PHONE NUMBER AND EXTENSION
Sue Mello	National Marine Fisheries	37-[illegible]270
PERSON CALLED	**OFFICE**	**PHONE NUMBER AND EXTENSION**
Dan Sullivan	Navigation Br, Operations Div	[illegible] 351

OUTGOING CALL

PERSON CALLING	OFFICE	PHONE NUMBER AND EXTENSION
PERSON CALLED	**ADDRESS**	**PHONE NUMBER AND EXTENSION**

SUMMARY OF CONVERSATION

Ms. Mello called to inform me that National [illegible] [illegible], [illegible] no objections to the proposed maintenance dredging of the [illegible] River

E-75

DA FORM 1 APR 66 751 REPLACES EDITION OF 1 FEB 58 WHICH WILL BE USED.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
P.O. BOX 1518
CONCORD, NEW HAMPSHIRE 03301

MAR 7 1984

Colonel Carl B. Sciple
Division Engineer
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Colonel Sciple:

This is in regard to the proposed maintenance dredging of a four hundred foot section of the Chelsea River in East Boston and Chelsea, Massachusetts. The eight thousand cubic yards of dredged material that will be generated would be disposed of at the Boston Foul Area.

This is the report of the Department of the Interior and the Fish and Wildlife Service, submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. et seq.).

Along with the project notice, we were provided a copy of an ecological evaluation of dredged material from Chelsea River, performed in March, 1981. Sample location C of the ecological evaluation is within the project area and was considered typical of the proposed dredged materials. The bioassay and bioaccumulation tests demonstrated that there is a significant potential for accumulated cadmium in sandworms, plus mercury and petroleum hydrocarbons in hard clams. We compared these values of accumulation with other river and harbor systems in New England. We have found that although the values of accumulation of the proposed dredged material were significantly higher than the reference values, they are similar to contaminant body burden values found elsewhere in New England. However, we are still concerned about the effect of subjecting living organisms in open ocean areas to low level contamination. The impacts from this chronic exposure is difficult to quantify, but we hope some data will come out of the DAMOS monitoring program.

We have no objection to the proposed dredging project provided point dumping of the dredged material at the disposal site be required. This would reduce the dispersion of the dredged sediments

MAR 12 1984

at the disposal site. In addition, we would prefer that no dredging be conducted from March 15 to June 15, of any year, to avoid subjecting nearby migrating anadromous fish to excessive water column turbidity, common with dredging operations. If further coordination regarding this project, please contact Gene Crouch at FTS 834-4797 of my staff.

Sincerely yours,

Gordon E. Beckett

Gordon E. Beckett
Supervisor
New England Field Office